A Field Guide for Identification and Interpretation of Ecosystems of the Rocky Mountain Trench, Prince George Forest Region

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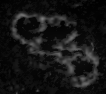

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A Field Guide for Identification and Interpretation of Ecosystems of the Rocky Mountain Trench, Prince George Forest Region

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1 INTRODUCTION

This field guide describes the ecological units of the Rocky Mountain Trench, Prince George Forest Region. It presents aids to the identification of these units and management interpretations for each.

Users of this guide must have been trained to identify vegetation and soil and site factors. Courses in identification are provided by the Prince George Regional Ecology Section (for details, contact the Regional Ecologist).

Units are described in the biogeoclimatic classification system. The classifications derived by the six Forest Regions are now being combined and correlated to ensure that no unit is described more than once, and that similar units are grouped. This has made it necessary to rename the biogeoclimatic units (subzones and variants) and the site units (formerly called "ecosystem associations", now "site series").

The ICHj described by the Prince George Region, for instance, has been recognized as being very similar to th ICHg1, ICHg2, and ICHg3 described just east of the Coast Mountains in the Prince Rupert Region. As a result, the ICHj has been renamed the ICHmc1, the ICHg1 has been renamed the ICHmc2, and the ICHg2 and ICHg3 -- recognized as being very similar -- have both been renamed the ICHmc3. Other name changes in this guide are summarized in Table 1. Eleven ICH subzones have been reduced to 7; 14 SBS subzones have been reduced to 9.

The site units have been correlated as well. The number of units has been reduced, and similar units in different variants have been given the same name. For instance, the units previously recognized as the ICHd/05, ICHj/06, and ICHk/07 are all now called "Dv - Devil's Club - Horsetail" units. The ICHb/03 and ICHb/04 have been lumped into one unit, as have the ICHk/01 and ICHk/05.

Until correlations of the ESSF and the wetland units have been completed, these should be referred to by their old names. When correlation is complete, the appropriate pages in this guide will be replaced with the new descriptions of the correlated units.

The guide is divided into eight sections: Section 2 describes the use of the guide; Section 3 describes the biogeoclimatic units (variants) included in the guide, and differentiates them; and Sections 4-9 describe the site units within each variant, and their management interpretations.

Previous publications on biogeoclimatic units of this area include MacKinnon and McLeod (1986), Utzig et al. (1986), McLeod et al. (1987a, 1987b), and Heidinger et al. (1987). Questions regarding the biogeoclimatic classification system in general, or the units described in this guide in particular, should be directed to: Regional Ecologist, Forest Sciences Section, B.C. Ministry of Forests and Lands, 1011 - 4th Avenue, Prince George, B.C. V2L 3H9, Telephone 565-6100.

TABLE 1. New names for biogeoclimatic and site units in the Rocky Mountain Trench, Prince George Forest Region.

Old Subzones and Ecosystem Associations	New Variants and Site Series
All ESSF units[a]	(no change yet)
ICHb	**ICHvk1**
01 Thimbleberry - Lady Fern	01: Cw - Devil's Club
02 Falsebox - Prince's Pine	02: Hw - Falsebox
03 Red Twinberry - False Sarsaparilla[b]	03: Cw - Utah Honeysuckle - Oak Fern
04 Black Huckleberry - Spiny Wood Fern[b]	03: Cw - Utah Honeysuckle - Oak Fern
05 Red-osier Dogwood - Horsetail	04: Cw - Devil's Club - Horsetail
06 Skunk Cabbage - Leafy Moss	05: Cw - Skunk Cabbage
ICHj	**ICHmc1**
01 False Azalea - Queen's Cup	01: Hw - Step Moss, Oak Fern
02 Douglas-fir - Falsebox	02: Hw - Bunchberry
03 Hemlock - Moss	03: Hw - Step Moss, Douglas-fir
04 Oak Fern - Step Moss	04: Cw - Oak Fern
05 Devil's Club - Oak Fern	05: Cw - Devil's Club
06 Devil's Club - Horsetail	06: Cw - Devil's Club - Horsetail
07 Black Spruce - Sphagnum[a]	07: Sb - Sphagnum
08 Skunk Cabbage - Sphagnum[a]	08: Skunk Cabbage - Sphagnum
ICHk	**ICHwk3**
01(a) Oak Fern - Step Moss, Coarse-Tex.[b]	01(a): Cw - Oak Fern, Coarse-Textured
01(b) Oak Fern - Step Moss, Fine-Tex.[b]	01(b): Cw - Oak Fern, Fine-Textured
02 Hemlock - Lichen	02: Hw - False Azalea - Lichen
03 Cedar - Moss	03: Hw - Bunchberry
04 Hemlock - Step Moss	04: Hw - Step Moss
05 Bramble - Step Moss[b]	01: Cw - Oak Fern
06(a) Devil's Club - Oak Fern, Coarse-Tex.	05(a): Cw - Devil's Club, Coarse-Textured
06(b) Devil's Club - Oak Fern, Fine-Tex.	05(b): Cw - Devil's Club, Fine-Textured
07(a) Black Twinberry - Horsetail, Fluv.	06(a): Cw - Devil's Club - Horsetail, Fluvial
07(b) Black Twinberry - Horsetail, Lac.	06(b): Cw - Devil's Club - Horsetail, Lacust.
08.1 Hemlock - Horsetail - Step Moss	07: Cw - Horsetail - Sphagnum
08.2 Hemlock - Horsetail - Sphagnum	07: Cw - Horsetail - Sphagnum
09 Mountain Alder - Skunk Cabbage[a]	09: Mountain Alder - Skunk Cabbage
10 Pine - Sphagnum[a]	10: Pl - Sphagnum
SESh	**SBSdh**
01.1 Spirea - Moss - Thimbleberry	01: Fd - Sx - Rough-leaved Ricegrass
01.2 Spirea - Moss - Velvet-Leaved Blueb.	01: Fd - Sx - Rough-leaved Ricegrass
02 Pine - Lichen	02: Pl - Velvet-leaved Blueberry - Lichen
03 Douglas-fir - Lichen	03: Fd - Lichen
04 Pine - Soopolallie	04: Pl - Pinegrass - Feathermoss
05.1 Pl - Lab. Tea - Short-Awned Ricegrass	05: Pl - Labrador Tea
05.2 Pl - Labrador Tea - Horsetail	05: Pl - Labrador Tea
06 Thimbleberry - Wild Sarsaparilla	06: Pl - Sx - Thimbleberry
07 Spruce - Horsetail	07: Sx - Horsetail
08 Black Spruce - Moss[a]	08: Sb - Moss
09 Black Spruce - Sphagnum[a]	09: Sb - Sphagnum

[a]ESSF and wetland units have not yet been correlated.
[b]These ecosystem associations have been combined into one site series in this variant.

2 USE OF THE GUIDE

2.1 Identifying Biogeoclimatic Units

Biogeoclimatic units are most easily identified from maps. Figure 1 provides an overview of the distribution of these units within the area covered by this guide. Biogeoclimatic unit maps at a scale of 1:250000 are available from the Ministry of Forests and Lands (MOFL) District Office in McBride, or from Ecology, Forest Sciences Section, MOFL, Prince George.

If an area lies near a mapped biogeoclimatic unit boundary and it is not clear which biogeoclimatic unit it belongs to, the user should compare the site units found in the area to those described for both biogeoclimatic units, and select the appropriate unit accordingly.

2.2 Identifying Site Units

Site units can be identified by a combination of soil, site and vegetation factors, which together are used to derive ecological moisture and nutrient regimes for the site. Having selected the appropriate biogeoclimatic unit (Section 2.1), the user should inspect the area under consideration to determine if there are obvious moisture or nutrient differences which have led to the development of several vegetation units on the site. If several site units appear to be present, the user should stratify the area before identifying these units. At each different site unit, the user then records site features (2.2.1) and vegetation features (2.2.2), and uses these to determine moisture and nutrient regimes (2.2.3).

2.2.1 Soils and topographic features

The most important topographic characteristics to note are: slope position (Appendix 1), slope gradient, and aspect. The most important soil characteristics to note are: soil texture (procedures for determining soil texture are given in Appendix 2); coarse fragment %; humus form and depth (procedures for determining humus form are given in Appendix 3); depth to water table; and rooting depth.

2.2.2 Vegetation features

The plant species on the site and their relative abundance should be noted. Vegetation as described in this guide is for climax or near-climax ecosystems; caution must be exercised in using vegetation to classify disturbed sites. Plant guides such as "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982) or "Some Common Plants of the Skeena Region" (Coupe et al. 1982) are helpful, and may be available from Ecology, Forest Sciences Section, MOFL, Prince George.

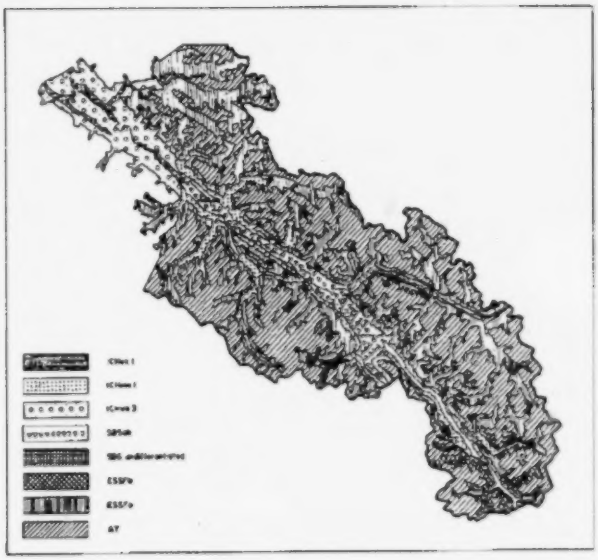


FIGURE 1. Biogeoclimatic units of the Rocky Mountain Trench area. Prince George Forest Region.

2.2.3 Moisture and nutrient regimes

The information from soils, topography and vegetation is used to estimate the relative amounts of moisture and nutrients available for plant growth. The guide user must keep two important factors in mind:

i. Moisture and nutrient regimes are relative within a biogeoclimatic unit. For instance, a site that is average in moisture regime in the ICHmk3 will be wetter than a site that is average in moisture regime in the ICHmc1.

ii. All factors must be taken into account when soil moisture and nutrient regime are determined. One factor may compensate for another; for instance, a coarse-textured soil, which might be expected to be dry, might be wetter if it occurred at the base of a slope.

Moisture and nutrient regimes can be estimated using the keys in Appendices 4 and 5.

2.2.4 Identification of units

After gathering soils, topographic, and vegetation information, the user should now proceed to:

i. the edatopic grid (e.g., Figure 2) where the moisture and nutrient regime can be used to locate the site unit on the grid; or

ii. the key to site units, where dichotomous keys use the soils, topographic, and vegetation features to identify a site unit.

The edatopic grid and the key to site units will direct the user to a particular site unit, or units. Soils, topographic, and vegetation features on the site can then be compared with those summarized for the particular site unit(s) to ensure the proper site unit is identified. Soil and site features considered characteristic of a certain site unit, or particularly useful in distinguishing it from other site units, are marked with an asterisk (*).

2.3 Management Interpretations

Once the site unit has been identified, the management interpretations for that unit are available on the page adjacent to the site unit description. Interpretations are offered as guidelines to the preparation of management prescriptions; they detail the opportunities and constraints that a resource manager must consider when dealing with a particular ecosystem.

3 BIOGEOCLIMATIC UNITS

The southeastern corner of the Prince George Forest Region is the most climatically diverse part of the region. It lies primarily in the Rocky Mountain Trench, bordered by the Cariboo Mountains to the west and the Rocky Mountains to the east. Four biogeoclimatic zones are represented in this region: the Interior Cedar - Hemlock (ICH) and Sub-boreal Spruce (SBS) zones on the valley floor and lower mountain slopes; and the Engelmann Spruce - Subalpine Fir (ESSF), and Alpine Tundra (AT) zones at higher elevations.

Six biogeoclimatic units have been described within the study area, three in the ICH (ICHvk1, ICHmc1, ICHwk3), one in the SBS (SBSdh), and two in the ESSF (ESSFb, ESSFo).

No units have been described in the Alpine Tundra zone and therefore this zone is not included in this guide.

3.1 Interior Cedar - Hemlock (ICH) Zone

The ICH zone within the study area can be found on the lower to mid-mountain slopes, or occasionally in the valley bottom at its northern extent. Below the ICH, in areas receiving cold air drainage, lies the SBS zone; above it, at subalpine elevations, lies the ESSF.

Within the ICH there is considerable climatic variation, especially in precipitation. The range in annual precipitation is from 712 mm in the ICHmc1 to 1510 mm in the ICHvk1.

The ICH forests differ from the SBS and ESSF forests in having climax forests dominated by western redcedar or western hemlock, rather than spruce, subalpine fir, or Douglas-fir.

Figure 1 shows the distribution of the biogeoclimatic units within the ICH, and Table 2 shows distinguishing vegetation features of the units.

3.1.1 ICHvk1 (previously ICHb)

The ICHvk1 occurs on slopes above McNaughton Lake, near the southern end of Canoe Reach. On the western side of the lake it occurs as far north as Baker Creek and on the eastern side as far north as Windfall Creek. Elevation ranges from 710 to 1370 m. The climate is considerably moister than the other ICH biogeoclimatic units in the study area (see Table 3). This is primarily because of the high snowfall received by this area. Seasonal (May - Sept.) precipitation is comparable to other ICH subzones.

The vegetation is composed mainly of mature western redcedar and western hemlock forests. Subalpine fir and hybrid white spruce are common in many ecosystems, tending to dominate sites influenced by cold air. Douglas-fir and western white pine are important seral tree species, primarily on drier sites. Cottonwood is commonly found on fluvial floodplains.

TABLE 2. Differentiating combinations of species for mesic sites in ICH variants in the Rocky Mountain Trench, Prince George Forest Region.

Species[a]	Biogeoclimatic variant		
	ICHwk1	ICHwk2	ICHwc1
Trees:			
Tsuga heterophylla	V-6[b]	IV-16	IV-24
Thuja plicata	IV-2	V-29	IV-10
Abies lasiocarpa	II-2	III-6	IV-6
Picea glauca x *engelmannii*	III-4	II-3	III-7
Shrubs:			
Lonicera utahensis	III-1		
Oplopanax horridum	V-24	V-9	III-1
Acer glabrum	III-1	IV-1	II-1
Menziesia ferruginea	II-1	IV-3	IV-3
Spiraea betulifolia		II-0	III-1
Herbs:			
Circaea alpina	IV-1	I-0	
Athyrium filix-femina	V-22	IV-1	
Viola spp.	V-0	I-0	I-1
Dryopteris assimilis	IV-11	III-2	III-0
Gymnocarpium dryopteris	V-16	V-44	IV-2
Lycopodium annotinum	II-0	IV-2	II-0
Chimaphila umbellata		III-1	IV-1
Goodyera repens		III-0	III-0
Pyrola chlorantha		II-0	III-0
Melampyrum canadense		I-0	III-1
Mosses:			
Mnium spp.	III-8	IV-3	II-0
Brachythecium spp.	II-7	IV-1	III-1
Rhytidiopsis robusta	II-2		
Hylocomium splendens	I-0	V-25	IV-38
Pleurozium schreberi	II-1	V-11	V-29
Ptilium crista-castrensis	I-1	V-9	V-12
Rhytidiadelphus triquetrus		V-17	V-8

[a] Only those species occurring in maturing seral to climax ecosystems are used.

[b] These numbers indicate the constancy (the % of sample plots in which the species occurs) and mean % cover for each species. Constancy: I=present in 1-20% of sample plots; II=present in 21-40% of sample plots; III=present in 41-60% of sample plots; IV=present in 61-80% of sample plots; V=present in 81-100% of sample plots. Mean % cover: given as a %. "IV-15", for example, indicates a species present in 61-80% of sample plots, with a mean cover of 15%. Missing symbols indicate that a species was not present or was very rare.

TABLE 3. Summary climate data for biogeoclimatic units[a,b].

BGC unit	Seasonal precipitation May-Sept (mm)		Annual precipitation (mm)		Seasonal mean temperature May-Sept (°C)		Annual mean temperature (°C)	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
SBSdh	229	177-278	568	423-743	12.4	10.8-13.1	+3.1	+1.7-+4.2
ICHvk1	369	309-488	1510	1229-1730	12.0	11.0-13.6	+3.1	+2.1-+4.4
ICHmc1	283	233-328	712	570-887	12.1	11.9-12.3	+4.0	
ICHwk3	402	285-482	1006	720-1185	10.8	10.1-11.5	+3.1	
ESSFD	510	414-587	2071	1677-2482	8.3	7.1-9.9	+0.3	-0.1-+1.5
ESSFo	308	217-369	816	533-998	8.4	6.6-10.4		
AT	417	340-490	1031	813-1250	5.4	4.2-6.6	-1.5	-1.3-+1.6

[a]Data from remote stations are normalized to a base station by Air Studies Branch, B.C. Ministry of Environment.
[b]Data from Environment Canada (1980) and B.C. Ministry of Environment.

3.1.2 ICHmc1 (previously ICHj)

The ICHmc1 extends from near the southern end of Canoe Reach on McNaughton Lake to just north of McBride, at an elevation range from 710 to 1370 m. It is the driest and warmest of the ICH biogeoclimatic units in the study area (Table 3).

Climax forests in the ICHmc1 are dominated by western redcedar and western hemlock, and include lesser amounts of spruce and subalpine fir. Western white pine is found in a few isolated pockets, reaching its northern limit in this unit.

Seral stands composed mostly of Douglas-fir, lodgepole pine, and trembling aspen are more common in this variant of the ICH than in any other for two possible reasons: the drier climate leads to drier forest fuel during summer lightning season; and a number of fires were lit during railroad construction approximately 60 years ago.

3.1.3 ICHwk3 (previously ICHk)

The ICHwk3 is found in the Rocky Mountain Trench from just north of McBride to near Dome Creek. Elevation ranges from 698 to 1370 m. The climate of the ICHwk3 is moister than the ICHmc1 but drier than the ICHvk1 (Table 3).

Climax forests in the ICHwk3 are dominated by western redcedar and western hemlock, and include minor amounts of spruce and subalpine fir. Douglas-fir is a long-lived seral species that is occasionally present on mesic or drier sites in this variant. Seral stands are composed primarily of trembling aspen; paper birch and Douglas-fir are uncommon. Lodgepole pine is generally restricted to the driest sites (where it occurs with western hemlock) and the wettest sites (where it occurs with black spruce).

3.2 Sub-Boreal Spruce (SBS) Zone

The SBS zone in the study area is found in the valley bottoms which receive cold air drainage. It generally occurs below the ICH zone, except on the east side of the Rocky Mountain Trench between Horsey Creek and Dave Henry Creek, where it extends right up to the ESSF. Forests in the SBS are dominated by spruce, Douglas-fir, subalpine fir, or lodgepole pine. Figure 1 shows the distribution of the biogeoclimatic units within the SBS.

3.2.1 SBS undifferentiated (previously SBSg)

The SBSg is found in valley bottoms between McBride and Dome Creek below the ICHk, or at higher elevations in some of the river valleys above the ICHk and below the ESSFp. Elevation ranges from approximately 700 to 1350 m. The SBSg is wetter than the SBSdh.

Climax forests are dominated by spruce and subalpine fir. Cedar and hemlock can be found regenerating under these stands, especially where the subzone borders the ICH.

The SBSg was not included in the correlation procedure because of a lack of sampling. For the purposes of this guide it will be treated as SBS undifferentiated and not dealt with again in the text. For interpretations for units, the user should follow the SBSvk (SBSf).

3.2.2 SBSdh (previously SBSh)

The SBSdh is found in the valley bottom of the Rocky Mountain Trench between Albreda and McBride, and the lower elevations of the northeast wall of the trench between Valemount and Dunster. The elevation ranges from a minimum of about 700 m along the Fraser River to approximately 1370 m.

The SBSdh is, in relative terms for the Prince George Region, dry and warm. It is the driest subzone in the Rocky Mountain Trench (Table 3), being especially dry during the summer months. The primary reason for the relatively dry climate is that the subzone lies in the rainshadow of the high mountains to the west (the Premier Range).

Because of the extensive fire history of the subzone, the dominant trees are lodgepole pine and Douglas-fir. Although they are primarily seral species in this subzone, they do form the climax canopy on drier sites. Because of the fire history in the area, hybrid white spruce and subalpine fir climax stands are rare, only occurring as pure stands on wetter sites or on cooler northeast aspects. Trembling aspen, paper birch, and cottonwood are seral components of some ecosystems. Black spruce is present on poorly to very poorly drained sites. Western redcedar occurs sporadically throughout the subzone, usually on wetter, cooler sites.

3.3 Engelmann Spruce - Subalpine Fir (ESSF) Zone

The ESSF is the subalpine zone above the ICH or SBS. It generally occurs between the elevations of 1370 and 2200 m.

Climatic data are minimal (Table 3), but in general the zone is characterized by higher precipitation, cooler temperatures, and a shorter growing season than the zones below it.

Climax forests are dominated by subalpine fir and Engelmann spruce. At the upper elevations of this zone, where the climate becomes more severe, the forests begin to open, and eventually form clumped, stunted stands. This area is referred to as the parkland.

The distributions of the two subzones described are shown in Figure 1.

3.3.1 ESSFb

The ESSFb occurs in the southern end of the area covered by this guide. It occurs as far north as Baker Creek on the eastern side of the valley and Windfall Creek on the western side. The elevation ranges from approximately 1200 to 2200 m.

The ESSFb is the wetter of the two subzones (see Table 3), with both higher rainfall and snowfall. The two subzones have a similar temperature regime.

High levels of precipitation have limited the occurrence of wildfires so that extensive older climax stands are frequent. The general absence of seral tree species and the dominance of Engelmann spruce and subalpine fir distinguishes this subzone from the lower elevation ICHvk1. The presence of hemlock and absence of lodgepole pine distinguishes it from the ESSFo.

3.3.2 ESSFo

The ESSFo occurs in the northern half of the area covered by this guide. It borders the ESSFb in the south, and stretches as far north as the Dore River on the western side of the valley, and Forgetmenot Creek on the eastern side.

The ESSFo is drier than the ESSFb (it is one of the driest ESSF subzones in the Prince George Region), but has a similar temperature regime (see Table 3).

Climax forests are dominated by Engelmann spruce and subalpine fir. Wildfires are more common in this subzone than in the ESSFb, and thus seral species such as lodgepole pine and limber pine are present, especially on drier sites.

NOTES

4 THE ICHvk1 VARIANT

FIGURE 2. Geographic location of the ICHvk1 variant in the Prince George Forest Region.

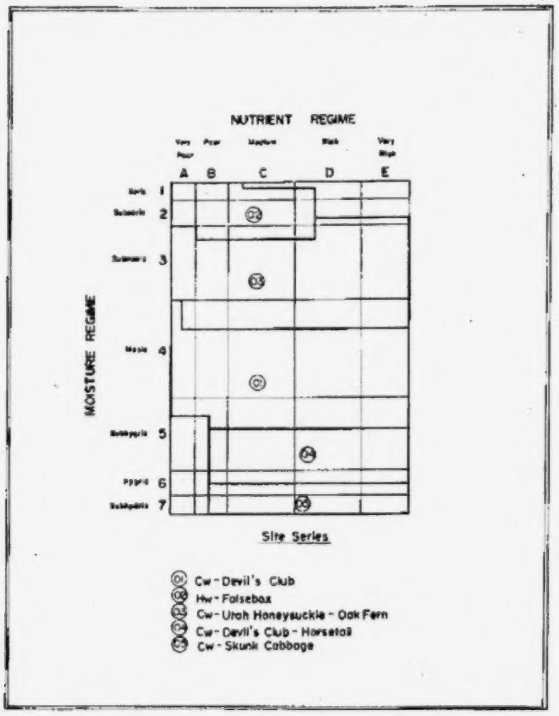


FIGURE 3. Edatopic grid for the ICHvk1 variant.

KEY TO SITE UNITS OF THE ICHVk1

1a Organic or mineral soils; water table present at or near surface; herb layer dominated by Lysichiton americanum (skunk cabbage)

ICHVk1/05

1b Mineral soils; water table absent, or occasionally present at depth; Lysichiton americanum low cover (<1%) or absent

2a Lower slope to toe or depression; water table may be present at depth; Cornus sericea (p. 8)* and Equisetum spp. (p. 24) abundant (>5% each)

ICHVk1/04

2b Lower to upper slope; water table rarely present; Cornus sericea and Equisetum spp. low cover (< 1% each) or absent

3a Usually mid-slope on morainal materials; shrub layer with Rubus parviflorus (p. 12), herb layer with Athyrium filix-femina (p. 22), moss layer with Mnium spp. (pp. 60-61)

ICHVk1/01

3b Upper slope, or mid- to lower slope on coarse-textured materials; Rubus parviflorus, Athyrium filix-femina and Mnium spp. low cover (usually< 1%) or absent

4a Upper to lower slope, soils usually not shallow to bedrock; Douglas-fir and/or hybrid white spruce commonly present in the canopy; Oplopanax horridus (p. 10), Dryopteris assimilis (p. 23), and Gymnocarpium dryopteris (p. 26) present

ICHVk1/03

4b Upper slope to crest, soils often shallow to bedrock; Douglas-fir and hybrid white spruce commonly absent from the canopy; Oplopanax horridus, Dryopteris assimilis, and Gymnocarpium dryopteris absent

ICHVk1/02

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

ICHvkIOI

CW - DEVIL'S CLUB

Oplopanax horridus

Athyrium filix-femina

Gymnocarpium dryopteris

VEGETATION

Tree Layer: 40% cover
Western redcedar, western hemlock, hybrid white spruce

Shrub Layer: 45% cover

Oplopanax horridus	(devil's club)
Vaccinium ovalifolium	(oval-leaved blueberry)
Rubus parviflorus	(thimbleberry)
western hemlock	
western redcedar	

Herb Layer: 65% cover

Gymnocarpium dryopteris	(oak fern)
Tiarella unifoliata	(one-leaved foamflower)
Athyrium filix-femina	(lady fern)
Galium triflorum	(sweet-scented bedstraw)
Streptopus roseus	(rosy twistedstalk)
Streptopus amplexifolius	(clasping twistedstalk)
Dryopteris assimilis	(spiny wood fern)
Clintonia uniflora	(queen's cup)
Circaea alpina	(enchanter's nightshade)
Cornus canadensis	(bunchberry)
Viola canadensis	(Canada violet)

Moss Layer: 20% cover

Mnium spp.	(leafy mosses)

SOIL AND SITE

Moisture Regime:	mesic - subhygric
Nutrient Regime:	very poor - poor
Slope Gradient (%):	24 (0-55)
Parent Material:	fluvial, colluvial, and morainal
* Soil Texture:	medium - coarse
* Coarse Fragments (%):	40 (0-80)
Seepage Water:	very rarely present

DISTRIBUTION: very common

CW - DEVIL'S CLUB (ICNVk1/01)

INTERPRETATIONS

Management objectives:	- manage for PC or 5x peeler logs on a 75-year rotation. - salvage before rehabilitation.
Concerns:	- snow-break
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce heavy slash; prepare planting spots; minimize future brush competition; improve planter access
Mechanical	- mounding may be useful on medium-textured soils; V-plows on coarse-textured soils when the soils are dry; FMC with 6-way blade on finer-textured soils or steeper slopes
Prescribed fire	- broadcast burn (remove L and F horizons)
Species choice:	
Preferred	- Pd, Sx
Acceptable	- Cw, Pw, Pl
Brush hazard:	- high (thimbleberry, red raspberry, fireweed, lady fern)
Silviculture applications:	- expect and maintain natural regeneration of Cw, Pw and Pl to augment planted stock. - wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth - expect Cw, Pw and Pl to be pole size at 40 years; look at a possible commercial thinning at this time. - a brushing and weeding program will probably be required. - use large planting stock.
Silviculture problems:	- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting; the use of herbicides to control brush may also be required. - Pw blister rust may kill stems within 40 years but by this time Pw will likely be pole size and perhaps of an economical size to justify a commercial thinning. - the extremely high snowpack in the subzone may damage young Pd.

ICHvk1 02

HW - FALSEBOX

Paxistima myrsinites

Vaccinium membranaceum

Clintonia uniflora

VEGETATION

Tree Layer: 55% cover
Western hemlock, western redcedar

Shrub Layer: 30% cover

Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Paxistima myrsinites	(falsebox)
Lonicera utahensis	(Utah honeysuckle)
Taxus brevifolia	(western yew)
western hemlock	
western redcedar	

Herb Layer: 10% cover

Clintonia uniflora	(queen's cup)
Orthilia secunda	(one-sided wintergreen)
Goodyera oblongifolia	(rattlesnake-plantain)
Cornus canadensis	(bunchberry)
Chimaphila umbellata	(prince's pine)
Tiarella unifoliata	(one-leaved foamflower)
Linnaea borealis	(twinflower)
Viola orbiculata	(round-leaved violet)
Pyrola asarifolia	(rosy wintergreen)

Moss Layer: 65% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Rhytidiopsis robusta	(pipecleaner moss)

SOIL AND SITE

Moisture Regime:	xeric - subxeric
Nutrient Regime:	very poor - medium
Slope Gradient (%):	30 (0-72)
Parent Material:	variable
* Soil Texture:	medium - coarse
* Coarse Fragments (%):	42 (0-70)
* Soil Drainage:	well - rapidly

DISTRIBUTION: common

MW - FALSEBOX (ICHwk1/02)

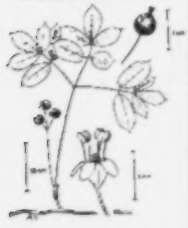
INTERPRETATIONS

Management objectives:	- manage for Pd sawlog on an 85-year rotation. - salvage before rehabilitation.
Concerns:	- snow-break
Logging:	- clearcut
Site preparation:	
Objectives	- maintain organic layers; reduce debris; prepare site for natural regeneration; control mistletoe; remove undesirable advance regeneration (Hw, Bl)
Mechanical	- scarification with Lano or drag on slopes 30%
Prescribed fire	- do not burn
Species choice:	
Preferred	- Pd
Acceptable	- Lw
Brush hazard:	- moderate (black huckleberry, fireweed)
Silviculture applications:	- if natural regeneration unsuccessful, plant Pd. - complete planting by mid-June. - may need a juvenile spacing program approximately 10 years after natural regeneration is established.
Silviculture problems:	- moderate brush competition will likely occur within 3 years of harvesting; sites should therefore be inspected at 3 years to determine if any further treatments are required. - the very high snowpack in this subzone may damage young Pd.

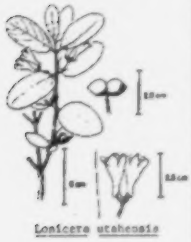
ICHvkl 03

CW - UTAH HONEYSUCKLE - OAK FERN

Paxistima myrsinites



Aralia nudicaulis



Lonicera utahensis

VEGETATION

Tree Layer: 45% cover
Western hemlock, western redcedar, hybrid white spruce, Douglas-fir

Shrub Layer: 25% cover

Vaccinium ovalifolium	(oval-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
Lonicera utahensis	(Utah honeysuckle)
Oplopanax horridus	(devil's club)
Taxus brevifolia	(western yew)
[Paxistima myrsinites	(falsebox)]
western hemlock	
western redcedar	

Herb Layer: 45% cover

Cornus canadensis	(bunchberry)
Dryopteris assimilis	(spiny wood fern)
Gymnocarpium dryopteris	(oak fern)
Clintonia uniflora	(queen's cup)
Tiarella unifoliata	(one-leaved foamflower)
Rubus pedatus	(five-leaved bramble)
Goodyera oblongifolia	(rattlesnake-plantain)
Aralia nudicaulis	(wild sarsaparilla)
Streptopus roseus	(rosy twistedstalk)

Moss Layer: 45% cover

Rhytidiopsis robusta	(pipecleaner moss)
Pleurozium schreberi	(red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	very poor - very rich
Slope Gradient (%):	24 (0-70)
Parent Material:	variable
Soil Texture:	medium - coarse
* Coarse Fragments (%):	45 (0-89)
* Soil Drainage:	moderately well - well

DISTRIBUTION: common

CW - UTAH HONEYSUCKLE - OAK PHASE (ICHVk1/03)

Management objectives:
- manage for Pd sawlog on a 75-year rotation.
- salvage before rehabilitation.

Concerns:
- snow-break

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access

Mechanical
- patch scarifiers or disc trenchers for lighter slash; V-plows, or patch scarifiers with V-plow or brush blade for heavier slash; FMC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire
- broadcast burn (remove L and F horizons)

Species choice:

Preferred
- Pd

Acceptable
- Pw, Pl, Lw

Brush hazard:
- moderate (black huckleberry, bracken fern, fireweed)

Silviculture applications:
- expect and maintain natural regeneration of Pw, Pl and Lw.
- Pw, Pl and Lw will likely be pole size 40 years after plantation establishment; can look at a possible commercial thin at this time.
- complete planting by mid-June.
- use large planting stock.
- may need a juvenile spacing program approximately 10 years after planting.

Silviculture problems:
- moderate competition will likely occur within 2 years of harvesting; sites should be inspected at 2 years to determine if any further treatments are required.
- Pw blister rust may kill stems within 40 years but by this time Pw will likely be pole size and perhaps of an economical size to justify a commercial thin.
- the extremely high snowpack in this subzone may damage young Pd.

ICHvk104

CW - DEVIL'S CLUB - HORSETAIL

Vaccinium ovalifolium

Vaccinium parvifolium

Dryopteris austriaca

VEGETATION

Tree Layer: 40% cover
Hybrid white spruce, western redcedar, black cottonwood

Shrub Layer: 55% cover

Cornus sericea	(red-osier dogwood)
Vaccinium ovalifolium	(oval-leaved blueberry)
Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Lonicera involucrata	(black twinberry)
western redcedar	
hybrid white spruce	
western hemlock	

Herb Layer: 50% cover

Galium triflorum	(sweet-scented bedstraw)
Equisetum arvense	(common horsetail)
Gymnocarpium dryopteris	(oak fern)
Tiarella unifoliata	(one-leaved foamflower)
Streptopus roseus	(rosy twistedstalk)
Pyrola asarifolia	(rosy wintergreen)
[Athyrium filix-femina	(lady fern)]
[Dryopteris austriaca	(spiny wood fern)]

Moss Layer: 35% cover

Mnium spp.	(leafy mosses)
[Rhytidiadelphus squarrosus	(hant-leaf moss)]

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	medium - very rich
Slope Gradient (%):	2 (0-18)
Soil Texture:	(medium -) moderately coarse - coarse
Coarse Fragments (%):	15 (0-37)
* Seepage Water:	may be present at depth
* Soil Drainage:	moderately well - well

DISTRIBUTION: uncommon

CW - DEVIL'S CLUB - HORSETAIL (ICHVk1/04)

INTERPRETATIONS

Management objectives:	- manage for Sx pecler log on a 75-year rotation. - salvage before rehabilitation. - protect the high fisheries and wildlife values.
Concerns:	- snow-break - high windthrow hazard - high fish and wildlife values
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; prepare planting spots above water table; improve planter access
Mechanical	- may be limited by trafficability; mounding will be feasible on some sites with medium-textured soils
Prescribed fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Sx
Acceptable	- Cw
Brush hazard:	- very high (thimbleberry, black twinberry, lady fern)
Silviculture applications:	- expect and maintain natural regeneration of Cw. - planting can take place at any time of the growing season. - use large planting stock. - wide screefing (30 cm x 30 cm) will be beneficial for seedling survival and growth. - will likely need a juvenile spacing program approximately 10 years after planting. - Cw will likely be pole size at 40 years, therefore, consider removing Cw as part of any commercial thinning project.
Silviculture problems:	- very high brush competition will require an inspection of harvested sites at time periods 2 and 4 years after planting - if commercial thinning is undertaken, extreme care must be taken to minimize windthrow.

CW - SKUNK CABBAGE

Cornus sericea

Equisetum arvense

Lonicera involucrata

VEGETATION

Tree Layer: 30% Cover
Western hemlock, western redcedar. (hybrid white spruce)

Shrub Layer: 20% cover

Oplopanax horridus	(devil's club)
Vaccinium ovalifolium	(oval-leaved blueberry)
Menziesia ferruginea	(false azalea)
western hemlock	
western redcedar	

Herb Layer: 80% cover

Athyrium filix-femina	(lady fern)
Lysichiton americanum	(skunk cabbage)
Cornus canadensis	(bunchberry)
Gymnocarpium dryopteris	(oak fern)
Tiarella unifoliata	(one-leaved foamflower)
Lycopodium annotinum	(stiff club-moss)
Rubus pedatus	(five-leaved bramble)
Equisetum sylvaticum	(wood horsetail)
Equisetum arvense	(common horsetail)
Clintonia uniflora	(queen's cup)
Galium triflorum	(sweet-scented bedstraw)
Streptopus roseus	(rosy twistedstalk)
Streptopus amplexifolius	(clasping twistedstalk)
Streptopus streptopoides	(small twistedstalk)

Moss Layer: 80% cover

Mnium spp.	(leafy mosses)
Sphagnum spp.	(sphagnum mosses)
Pleurozium schreberi	(red-stemmed feathermoss)
Barbilophozia lycopodioides	(common leafy liverwort)

SOIL AND SITE

Moisture Regime:	hygric - subhygric
Nutrient Regime:	poor - very rich
Slope Gradient (%):	15 (0-25)
* Parent Material:	often organic
Soil Texture:	variable
Coarse Fragments (%):	15 (0-45)
* Soil Drainage:	imperfectly - very poorly
* Seepage Water:	always present

DISTRIBUTION: uncommon

CW - SKUNK CABBAGE (ICHVK1/05)

INTERPRETATIONS

Management objectives:	- manage for Sx sawlog on a 75-year rotation. - manage for Cw poles. - this association will likely be an inclusion within a treatment unit, because it generally is small in size.
Concerns:	- snow-break - high water table
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; elevate seedlings above water table; minimize future brush competition
Mechanical	- will usually be limited by trafficability; mounding may be feasible on some sites with medium-textured soils during very dry summers
Prescribed fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred Acceptable	- Sx - Cw, Bl
Brush hazard:	- high (lady fern, thimbleberry)
Silviculture applications:	- expect and maintain natural regeneration of Cw and Bl. - plant after water table drops below ground level and put Sx on drier microsites (i.e., mounds). - use large planting stock. - wide screefing (30 cm x 30 cm) will be beneficial for seedling survival and growth. - may need a juvenile spacing program approximately 10 years after planting.
Silviculture problems:	- this association is critical to the control of runoff and stream flow. - water table will likely rise above the ground surface in the spring causing seedling mortality. - herbicide use to control brush competition may conflict with the need to protect fish and wildlife values. - high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.

5 THE ICHmc1 VARIANT

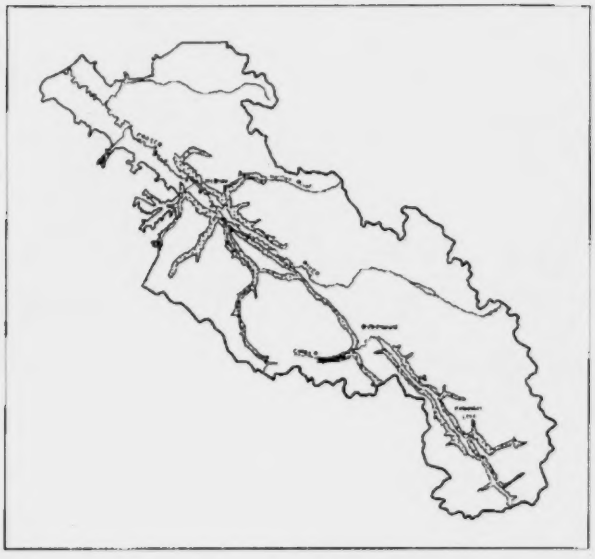


FIGURE 4. Geographic location of the ICHmc1 variant in the Prince George Forest Region.

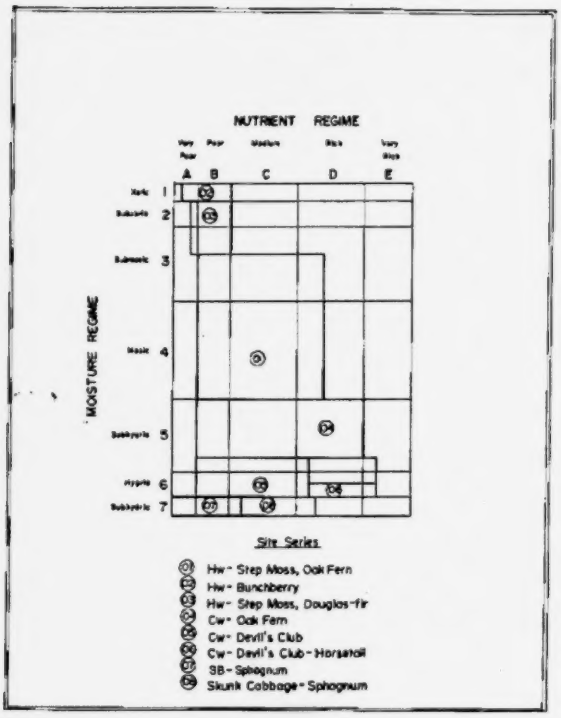


FIGURE 5. Edatopic grid for the ICHmc1 variant

KEY TO SITE UNITS OF THE ICHmc1

1a Black spruce in canopy; organic soil; water table close to surface
ICHmc1/07

1b Black spruce low cover or absent; mineral soil; water table variable

2a Canopy dominated by douglas-fir; mid- to upper slope; slope greater than 50%; south to west aspect; Paxistima myrsinites (p. 10)* moderate to high cover (>10%)
ICHmc1/02

2b Canopy dominated by western redcedar, western hemlock or a mixed canopy; mid- to lower slope or, if upper slope, canopy dominated by western hemlock; slopes usually less than 40%; aspect variable; Paxistima myrsinites low cover (<1%) or absent

3a Tree canopy (western hemlock, western redcedar, hybrid white spruce) poorly developed and low cover (<30%); water table close to surface; Lysichiton americanum (skunk cabbage) moderate to high cover (>10%)
ICHmc1/08

3b Tree canopy well developed and moderate to high cover (>50%); water table not close to surface; Lysichiton americanum low cover (<1%) or absent

4a Lower to toe slope; Oplopanax horridus (p. 10) moderate to high cover (>15%)

5a Canopy primarily western redcedar; humus thickness greater than 30 cm; permanent seepage; Equisetum spp. (p. 24) moderate to high cover (usually >10%)
ICHmc1/06

5b Canopy a mixture of western redcedar and western hemlock; humus thickness less than 30 cm; temporary seepage; Equisetum spp. low cover (usually <1%) or absent
ICHmc1/05

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

4b Mid- to lower slope: Oplopanax horridus low cover (<5%) or absent

6a Mid- to lower slope: Gymnocarpium dryopteris moderate to high cover (>15%)

ICHmc1/04

6b Usually mid- to upper slope, or level: Gymnocarpium dryopteris low cover (usually <5%) or absent

7a Canopy of Hw, Cw, Sx and Bl, often with a minor component of Fd or Pl; herb layer moderately poorly developed (>15% cover), with Clintonia uniflora (p. 22) and Gymnocarpium dryopteris (p. 26) sometimes present

ICHmc1/01

7b Canopy of Hw, sometimes with a minor component of Cw; herb layer extremely poorly developed (<10% cover), with Clintonia uniflora and Gymnocarpium dryopteris absent

ICHmc1/03

ICHmcl|01

Hw - STEP MOSS, OAK FERN

Menziesia ferruginea

Clintonia uniflora

Pleurozium schreberi

VEGETATION

Tree Layer: 75% cover
Hybrid white spruce, subalpine fir, western hemlock, western redcedar

Shrub Layer: 25% cover

Vaccinium membranaceum	(black huckleberry)
Menziesia ferruginea	(false azalea)
Rubus parviflorum	(thimbleberry)
Ribes lacustre	(black gooseberry)
Sorbus scopulina	(western mountain-ash)
western redcedar	
western hemlock	

Herb Layer: 20% cover

Cornus canadensis	(bunchberry)
Gymnocarpium dryopteris	(oak fern)
Clintonia uniflora	(queen's cup)
Smilacina racemosa	(false Solomon's-seal)
Orthilia secunda	(one-sided wintergreen)
Linnaea borealis	(twinflower)
Goodyera oblongifolia	(rattlesnake-plantain)
Streptopus amplexifolius	(clasping twistedstalk)

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail)
Hylocomium splendens	(step moss)

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	poor - medium
Slope Gradient (%):	19 (0-42)
* Slope Position:	usually mid -
Parent Material:	(glacio)fluvial, morainal
* Soil Texture:	medium - coarse
Coarse Fragments (%):	29 (0-87)
Site Index:	Pl 31 (30-32)
	Fd 32 (30-35)
	Sx 30 (28-35)

COMMENTS
Coarse-textured soils receive some seepage during the growing season.

DISTRIBUTION: common

KW - STEP MOSS, OAK FERN (ICHmc1/01)

INTERPRETATIONS

Management objectives:
- manage for Fd or Sx peeler logs on an 80-year rotation.
- salvage before rehabilitation.

Concerns:
- possible cankers

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; prepare planting spots; improve planter access; remove undesirable advance regeneration

Mechanical
- patch scarifiers or disc trenchers for lighter slash; V-plows, brush blades or Rden rake for heavier slash; FNC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire
- broadcast burn (remove L horizon) or windrow and burn

Species choice:

Preferred
- Fd, Sx

Acceptable
- Pl, Pw

Brush hazard:
- low/moderate (thimbleberry, fireweed)

Silviculture applications:
- accept and maintain Pl and Pw component.
- accept Cw at up to 300 stems per hectare.
- wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- complete planting by mid-June.
- Pl, Pw and Cw will likely be pole size at 40 years, therefore consider removing merchantable stems as part of any commercial thinning project.
- a juvenile spacing project may be required at 15-20 years after planting, but retain as much of a Cw component as possible.
- plant submesic sites within 3 weeks of snow melt and in most microsites.
- assess presence of dwarf mistletoe in Pl types and apply necessary sanitation practices.

Silviculture problems:
- the humus forms on these sites are thin and removal of more than the litter layer will probably seriously affect site productivity.

ICHmc|02

HW - BUNCHBERRY

Paxistima myrsinites

Pleurozium schreberi

Chimaphila umbellata

VEGETATION

Tree Layer: 70% cover
Douglas-fir, western redcedar, (lodgepole pine, hybrid white spruce)

Shrub Layer: 50% cover

Paxistima myrsinites	(falsebox)
Menziesia ferruginea	(false azalea)
Shepherdia canadensis	(soopolallie)
western redcedar	
subalpine fir	

Herb Layer: 8% cover

Chimaphila umbellata	(prince's pine)

Moss Layer: 30% cover

Pleurozium schreberi	(red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime:	xeric
Nutrient Regime:	very poor - poor
* Aspect	W to SSW
* Slope Gradient (%):	64 (50-70)
* Slope Position:	upper to mid
Parent Material:	usually colluvial
* Soil Texture:	coarse
Coarse Fragments (%):	70 (50-80)
Site Index:	Fd 28
	Pl 30

COMMENTS
There is often a fairly high cover of cobbles and stones on the surface although most of them are covered with bryophytes or lichens. Limited data because of the rarity of the ecosystem.

DISTRIBUTION: uncommon

HW - BURNCHBERRY (ICHmc1/02)

INTERPRETATIONS

Management objectives:	- non-commercial at this time. - leave sites until future technological improvements occur. - sites will probably be inclusions within a treatment unit.
Concerns:	- possible cankers
Logging:	- clearcut
Site preparation:	
Objectives	- maintain organic layers; reduce debris; prepare site for natural regeneration; control mistletoe; remove undesirable advance regeneration (Hw, Bl)
Mechanical	- scarification with Lano or drag on slopes 30%
Prescribed fire	- do not burn
Species choice:	
Preferred	- Pl
Acceptable	- Fd
Brush hazard:	- low (false azalea)
Silviculture applications:	- promote a Fd and Pl mixture on the sites. - possible to direct seed Pl over the site but should check rodent populations first. - practice sanitation procedures on Pl when necessary.
Silviculture problems:	- pine beetle and dwarf mistletoe can be problems on Pl along with canker infestations on Fd. - monitor rodent populations and consider their impact when deciding on stocking levels.

ICHmc1 03

HW - STEP MOSS, DOUGLAS-FIR

Cornus canadensis

Menziesia ferruginea

Pleurozium schreberi

VEGETATION

Tree Layer: 85% cover
Western hemlock, western redcedar, (subalpine fir, Douglas-fir)

Shrub Layer: 30% cover

Menziesia ferruginea	(false azalea)
Vaccinium membranaceum	(black huckleberry)
western hemlock	
western redcedar	

Herb Layer: 10% cover

Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
Chimaphila umbellata	(prince's pine)
Rubus pedatus	(five-leaved bramble)
Linnaea borealis	(twinflower)

Moss Layer: 100% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(step moss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	submesic - subxeric
Nutrient Regime:	poor
Slope Gradient (%):	35 (0-75)
* Slope Position:	variable, commonly mid - crest
Parent Material:	variable
* Soil Texture:	coarse - moderately coarse
Coarse Fragments (%):	0-74 (usually greater than 20)
Site Index:	Pl 28 Fd 28 Sx 26

DISTRIBUTION: fairly common

MW - STEP MOSS, DOUGLAS-FIR (ICHmc1/03)

INTERPRETATIONS

Management objectives:
- manage for Fd or Sx peeler logs on an 80-year rotation.
- salvage before rehabilitation.

Concerns:
- possible cankers

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; prepare planting spots; improve planter access; remove undesirable advance regeneration

Mechanical
- patch scarifiers or disc trenchers for lighter slash; V-plows, brush blades or Eden rake for heavier slash; FMC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire
- broadcast burn (remove L horizon) or windrow and burn

Species choice:

Preferred
- Fd, Sx

Acceptable
- Pl, Pw

Brush hazard:
- low/moderate (thimbleberry, fireweed)

Silviculture applications:
- accept and maintain Pl and Pw component.
- accept Cw at up to 300 stems per hectare.
- wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- complete planting by mid-June.
- Pl, Pw and Cw will likely be pole size at 40 years, therefore consider removing merchantable stems as part of any commercial thinning project.
- a juvenile spacing project may be required at 15-20 years after planting, but retain as much of a Cw component as possible.
- plant submesic sites within 3 weeks of snow melt and in most microsites.
- assess presence of dwarf mistletoe in Pl types and apply necessary sanitation practices.

Silviculture problems:
- the humus forms on these sites are thin and removal of more than the litter layer will probably seriously affect site productivity.

ICHmcl 04

CW - OAK FERN

Gymnocarpium dryopteris

Menziesia ferruginea

Hylocomium splendens

VEGETATION

Tree Layer: 75% cover
Western hemlock, western redcedar, (hybrid white spruce, subalpine fir)

Shrub Layer: 25% cover

Menziesia ferruginea	(false azalea)
Vaccinium membranaceum	(black huckleberry)
Oplopanax horridum	(devil's club)
western hemlock	
western redcedar	

Herb Layer: 55% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Tiarella unifoliata	(one-leaved foamflower)
Orthilia secunda	(one-sided wintergreen)
Clintonia uniflora	(queen's cup)
Streptopus roseus	(rosy twistedstalk)
Moneses uniflora	(single delight)

Moss Layer: 60% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	subhygric
Nutrient Regime:	poor - very rich
* Slope Gradient (%):	19 (8-39)
* Slope Position:	mid- to lower
Parent Material:	variable
Soil Texture:	variable (moderately fine, medium and moderately coarse)
Coarse Fragments (%):	29 (0-91)
* Seepage Water:	may be present
Site Index:	Cw 26 (23-29) Sx 30 (24-40)

COMMENTS:
Seepage water may be present as these sites receive some seepage early in the growing season and possibly after heavy precipitation.

DISTRIBUTION: common

CW - OAK FERN (ICHmc1/04)

INTERPRETATIONS

Management objectives:	- manage for Fd sawlogs on a 70-year rotation and Sx sawlogs on an 80-year rotation. - salvage before rehabilitation.
Concerns:	- fine-textured moraines may be subject to compaction and may create windthrow problems
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access
Mechanical	- patch scarifiers or disc trenchers for lighter slash; V-plows, or patch scarifiers with V-plow or brush blade for heavier slash; FHC with 6-way blade for steeper slopes or finer-textured soils
Prescribed fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred Acceptable	- Fd, Sx - Pl, Pw
Brush hazard:	- low/moderate (thimbleberry, false azalea, fireweed)
Silviculture applications:	- accept and maintain Pl and Pw component. - accept Cw at up to 300 stems per hectare. - wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth. - if considering a commercial thinning, plant an additional 200 stems per hectare. - plant Sx on fine-textured sites and Fd on coarser sites.
Silviculture problems:	- moderate brush competition will likely occur within 3 years of harvesting, so sites should be inspected at 3 years to determine if any further treatment is required. - windthrow potential and compaction problems may be of concern on fine-textured moraines.

ICHmcl 05

CW - DEVIL'S CLUB

Oplopanax horridus

Ribes lacustre

Gymnocarpium dryopteris

VEGETATION

Tree Layer: 70% cover
Western redcedar, western hemlock, (hybrid white spruce, subalpine fir)

Shrub Layer: 80% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Menziesia ferruginea	(false azalea)
Rubus parviflorus	(thimbleberry)
western redcedar	
western hemlock	

Herb Layer: 45% cover

Gymnocarpium dryopteris	(oak fern)
Tiarella unifoliata	(one-leaved foamflower)
Streptopus amplexifolius	(clasping twistedstalk)
Cornus canadensis	(bunchberry)
Smilacina racemosa	(false Solomon's-seal)
Orthilia secunda	(one-sided wintergreen)
Dryopteris assimilis	(spiny wood fern)
Streptopus roseus	(rosy twistedstalk)

Moss Layer: 40% cover

Mnium spp.	(leafy mosses)
Hylocomium splendens	(stop moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	poor - very rich
* Slope Gradient (%):	26 (4-75)
* Slope Position:	commonly lower - toe
Soil Texture:	dominantly medium and coarse textured
Coarse Fragments (%):	36 (0-80)
Seepage Water:	may be present
Site Index:	Cw 26 (25-27)
	Sx 31 (29-34)

COMMENTS:
Coarse-textured soils compensated by seepage. All sites receive some seepage during the growing season.

DISTRIBUTION: very common

CW - DEVIL'S CLUB (ICHmc1/05)

INTERPRETATIONS

Management objectives:	- manage for Sx sawlogs on an 80-year rotation and Sx peeler logs on a 100-year rotation. - Salvage before rehabilitation.
Concerns:	- high windthrow hazard - soil compaction
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce heavy slash; prepare planting spots; minimize future brush competition; improve planter access
Mechanical	- mounding may be useful on medium-textured soils; V-plows on coarse-textured soils when the soils are dry; FMC with 6-way blade on finer-textured soils or steeper slopes
Prescribed fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred Acceptable	- Sx - Cw, Bl
Brush hazard:	- high (thimbleberry, red raspberry, fireweed)
Silviculture applications:	- accept and maintain Cw and Bl component. - wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth. - if considering a commercial thin, plant an additional 200 stems per hectare. - planting can take place anytime throughout growing season. - use large planting stock.
Silviculture problems:	- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting. - do not commercial thin if windthrow is considered to be a high hazard on the site.

ICHmc1 06

CW - DEVIL'S CLUB - HORSETAIL

Oplopanax horridus

Acer glabrum

Equisetum arvense

VEGETATION

Tree Layer: 70% cover
Western redcedar. (hybrid white spruce, subalpine fir, western hemlock)

Shrub Layer: 40% cover

Oplopanax horridus	(devil's club)
Acer glabrum	(douglas maple)
Viburnum edule	(highbush-cranberry)
Ribes lacustre	(black gooseberry)
western redcedar	
subalpine fir	

Herb Layer: 75% cover

Equisetum arvense	(common horsetail)
Equisetum pratense	(meadow horsetail)
Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Equisetum scirpoides	(dwarf scouring-rush)

Moss Layer: 50% cover

Mnium spp.	(leafy mosses)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Brachythecium spp.	

SOIL AND SITE

Moisture Regime:	hygric
Nutrient Regime:	rich - very rich
* Slope Gradient (%):	15 (0-30)
* Slope Position:	lower - toe
Parent Material:	lacustrine, or organic over fluvial
Soil Texture:	variable
Coarse Fragments (%):	usually 0
* Seepage Water:	present
Site Index:	Bl 34
	Cw 28
	Sx 33

COMMENTS:
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: uncommon

CW - DEVIL'S CLUB - HORSETAIL (ICHmc1/06)

INTERPRETATIONS

Management objectives:	- non-commercial at this time. - very rare occurrence.
Concerns:	- high water table
Logging:	- avoid logging

ICHmcl 07

SB - SPHAGNUM

Ledum groenlandicum

Carex spp.

Sphagnum spp.

VEGETATION

Tree Layer: 25% cover
Black spruce, (lodgepole pine)

Shrub Layer: 20% cover

Ledum groenlandicum	(Labrador tea)
Kalmia microphylla ssp. occidentalis	(bog-laurel)
western hemlock	
(lodgepole pine, black spruce)	

Herb Layer: 75% cover

Carex spp.	(sedges)
Cornus canadensis	(bunchberry)
Equisetum sylvaticum	(wood horsetail)

Moss Layer: 90% cover

Sphagnum spp.	(sphegnum)

SOIL AND SITE

Moisture Regime:	subhygric
Nutrient Regime:	very poor - poor
Slope Gradient (%):	0
* Slope Position:	depression
Parent Material:	organic
* Water Table (cm):	0-30
Coarse Fragments (%):	0

COMMENTS:
Bog ecosystems are very rare in this subzone.
Nutrient-poorer bogs have a lower cover of sedges.
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare

ES - SPHAGNUM (ICHmc1/07)

INTERPRETATIONS

Management objective:	- non-commercial at this time.
Concerns:	- high water table - cold, unproductive sites
Logging:	- avoid logging

ICHmcl 08

SKUNK CABBAGE - SPHAGNUM

Lysichiton americanum

Carex interior

Sphagnum spp.

VEGETATION

Tree Layer: 25% cover
Western hemlock, western redcedar, (hybrid white spruce, subalpine fir)

Shrub Layer: 60% cover

Vaccinium	ovalifolium	(oval-leaved blueberry)
Menziesia	ferruginea	(false azalea)
western hemlock		
western redcedar		

Herb Layer: 50% cover

Lysichiton	americanum	(skunk cabbage)
Carex	spp.	(sedges)
Rubus	pedatus	(five-leaved bramble)
Cornus	canadensis	(bunchberry)
Gymnocarpium	dryopteris	(oak fern)
Dryopteris	assimilis	(spiny wood fern)
Equisetum	sylvaticum	(wood horsetail)

Moss Layer: 95% cover

Sphagnum	spp.	(sphagnum)
Pleurozium	schreberi	(red-stemmed feathermoss)
Mnium	spp.	(leafy mosses)

SOIL AND SITE

Moisture Regime:	subhygric
Nutrient Regime:	poor - medium
* Slope Gradient (%):	1 (0-5)
* Slope Position:	depression
Parent Material:	usually organic
Coarse Fragments (%):	usually 0
Seepage Water (cm):	0-30

COMMENTS
Limited data because of the rarity of ecosystem.
Seepage water moves very slowly through these sites.

DISTRIBUTION: rare

SKUNK CABBAGE - SPHAGNUM (1Chmc1/08)

INTERPRETATIONS

Management objectives:	- non-commercial at this time. - very rare occurrence.
Concerns:	- high water table
Logging:	- avoid logging

6 THE ICHwk3 VARIANT

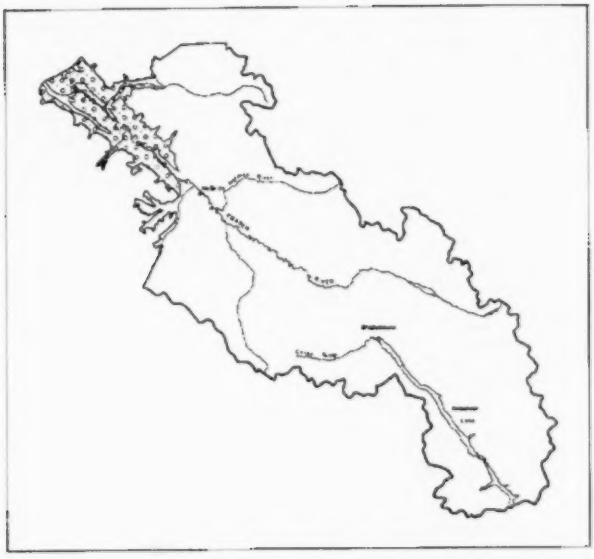


FIGURE 6. Geographic location of the ICHwk3 variant in the Prince George Forest Region.

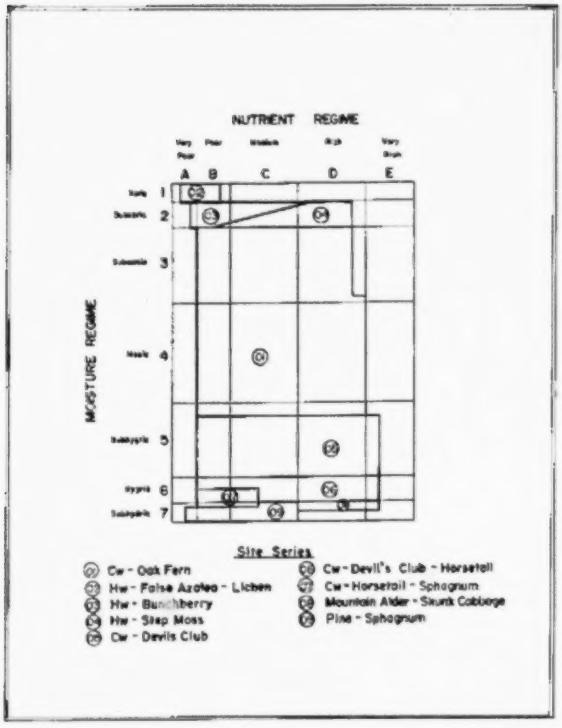


FIGURE 7. Edatopic grid for the ICHwk3 variant.

KEY TO SITE UNITS OF THE ICHwk1

1a Black spruce in canopy; organic soils; water table close to surface; Sphagnum spp. (p. 63)* dominant; bogs

ICHwk1/09

1b Black spruce absent from canopy; mineral soils; water table variable; Sphagnum spp. low cover (< 2%) or absent

2a Lodgepole pine in canopy, with western hemlock; dry rock outcrop; moderate to high cover (>30%) of lichens

ICHwk1/02

2b Lodgepole pine absent; not on a dry rock outcrop; lichens low cover (< 10%)

3a Narrow drainage channel; very uneven, open canopy; moderate to high cover of Lyrichiton americanum (skunk cabbage); water table close to surface

ICHwk1/08

3b Not a narrow drainage channel; well-developed canopy; Lyrichiton americanum low cover (< 1%) or absent; water table variable

4a Mid- to lower slope or level; Oplopanax horridum (p. 18) present, usually moderate to high cover (>10%)

5a Water table close to surface (within 50 cm); level; lacustrine parent material; tree canopy often stunted and with poor form; Sphagnum spp. (p. 63) moderate to high cover (> 10%)

ICHwk1/07

5b Water table at depths greater than 50 cm; parent materials variable; Sphagnum spp. low cover (<1%) or absent

6a Hybrid white spruce and subalpine fir greater than 50% of tree canopy; water table usually within 50 cm of surface; Equisetum spp. (p. 26) moderate to high cover (>5%)

ICHwk1/06

6b Western redcedar and western hemlock dominate canopy; water table variable; Equisetum spp. low cover (< 1%) or absent

7a Lower slope to level; seepage water often present; Oplopanax horridum high cover (>20%)

ICHwk1/05

7b Slope position variable; seepage water rarely present; Oplopanax horridum low to moderate cover (<20%)

ICHwk1/01

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

4b Often upper slope to crest; Eriogonum corrifolium absent

8a Generally not occuring on steep (>50%) slopes and soils not shallow (<1 m deep); Gymnocarpium dryopteris (p. 26) moderate to high cover (>10%)

IChwk3/01

8b Occuring on steep slopes slopes or shallow soils; Gymnocarpium dryopteris usually low cover (<10%) or absent

9a Occuring on steep slopes (>50%); aspect usually SE to SW; Gymnocarpium dryopteris absent

IChwk3/04

9b Occuring on gentle slopes (<10%); aspect variable; Gymnocarpium dryopteris present

IChwk3/03

ICHwk3 01(a)

CW - OAK FERN, COURSE-TEXTURED

Gymnocarpium dryopteris

Oplopanax horridus

Hylocomium splendens

VEGETATION

Tree Layer: 70% cover
Western redcedar, western hemlock (subalpine fir, hybrid white spruce)

Shrub Layer: 30% cover

Oplopanax horridus	(devil's club)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Ribes lacustre	(black gooseberry)
Menziesia ferruginea	(false azalea)
western redcedar	
western hemlock	
subalpine fir	

Herb Layer: 70% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Tiarella unifoliata	(one-leaved foamflower)
Tiarella trifoliata	(three-leaved foamflower)
Rubus pedatus	(five-leaved bramble)
Clintonia uniflora	(queen's cup)
Goodyera oblongifolia	(rattlesnake-plantain)

Moss Layer: 70% cover

Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	submesic - subhygric
Nutrient Regime:	poor - medium
Slope Gradient (%):	21 (3-67)
* Slope Position:	usually mid
* Parent Material:	morainal or fluvial
Soil Texture:	medium - moderately coarse
Coarse Fragments (%):	25 (0-54)
Seepage Water:	rarely present
Site Index:	Cw 23 (21-25)
	Sx 23 (22-24)

DISTRIBUTION: very common

CW - OAK FERN, COARSE-TEXTURED (ICHwk3/01(a))

INTERPRETATIONS

Management objectives: - manage for Fd or Sx sawlogs on a 65-year rotation or peeler logs on an 85-year rotation..

Concerns: - windthrow in Sx
- possible moisture deficit over dry summers on submesic sites

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access

Mechanical - patch scarifiers or disc trenchers for lighter slash; V-plows, or patch scarifiers with V-plow or brush blade for heavier slash; FMC with 6-way blade for steeper slopes or finer-textured soils

Prescribed fire - broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn

Species choice:

Preferred - Sx
Acceptable - Fd

Brush hazard: - low to moderate (thimbleberry, red raspberry, fireweed)

Silviculture applications: - maintain Cw at up to 300 stems per hectare
- do not remove humus layers; burn lightly or mix with mineral soil.
- wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- possibly fertilize after commercial thinning; if considering a commercial thin, plant an additional 200 stems per hectare.

Silviculture problems: - moderate brush competition will likely occur within 7 years of harvesting, so sites should be inspected at 3 years to determine if any further treatment is required.

ICHwk3 01(b)

CW - OAK FERN, FINE-TEXTURED

Gymnocarpium dryopteris

Oplopanax horridus

Hylocomium splendens

VEGETATION

Tree Layer: 70% cover
Western redcedar, western hemlock (subalpine fir, hybrid white spruce)

Shrub Layer: 30% cover

Oplopanax horridus	(devil's club)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Ribes lacustre	(black gooseberry)
Menziesia ferruginea	(false azalea)
western redcedar	
western hemlock	
subalpine fir	

Herb Layer: 70% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Tiarella unifoliata	(one-leaved foamflower)
Tiarella trifoliata	(three-leaved foamflower)
Rubus pedatus	(five-leaved bramble)
Clintonia uniflora	(queen's cup)
Goodyera oblongifolia	(rattlesnake-plantain)

Moss Layer: 70% cover

Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	mesic - subhygric
Nutrient Regime:	medium - rich
Slope Gradient (%):	7 (0-11)
* Slope Position:	usually mid
* Parent Material:	lacustrine
Soil Texture:	medium - fine
Coarse Fragments (%):	usually 0
Seepage Water:	rarely present
Site Index:	Cw 22 (20-23)
	Sx 28 (26-33)

DISTRIBUTION: very common

CW - OAK PERN, FINE-TEXTURED (TCHwA3/01(b))

INTERPRETATIONS

Management objective:	- manage for Sx sawlogs on an 80-year rotation.
Concerns:	- windthrow in Sx - frost heaving - soil compaction
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access; avoid soil compaction
Mechanical	- not recommended
Prescribed fire	- broadcast burn (remove L and F horizons)
Species choice:	
Preferred	- Sx
Brush hazard:	- moderate (thimbleberry, red raspberry, fireweed)
Silviculture applications:	- maintain Cw at up to 300 stems per hectare - do not remove humus but reduce hazard on site by light burning or by clean logging. - no mechanical treatments should be allowed. - wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth. - if considering a commercial thin, plant an additional 200 stems per hectare and juvenile space. - possibly fertilize after commercial thinning.
Silviculture problems:	- moderate brush competition will likely occur within 3 years of harvesting, so sites should be inspected at 3 years to determine if any further treatment is required.

ICHwk3 02

HW - FALSE AZALEA - LICHEN

Menziesia ferruginea

Cladina spp.

Pleurozium schreberi

VEGETATION

Tree Layer: 35% cover
Western hemlock, lodgepole pine

Shrub Layer: 65% cover

Menziesia ferruginea	(false azalea)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
western hemlock	
lodgepole pine	

Herb Layer: 5% cover

Empetrum nigrum	(crowberry)

Moss Layer: 100% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Cladina spp.	
Cladonia spp.	
Stereocaulon paschale	

SOIL AND SITE

Moisture Regime:	xeric
Nutrient Regime:	very poor - poor
Slope Gradient (%):	5 (0-30)
* Slope Position:	crest - upper
* Parent Material:	bedrock, and shallow veneer over bedrock
Soil Texture:	medium - coarse
Coarse Fragments (%):	4 (0-10)
Site Index:	P1 9

COMMENTS
High cover (35%) of exposed bedrock. Limited data because of the rarity of the ecosystem.

DISTRIBUTION: very rare

HW - FALSE AZALEA - LICHEN (ICHWk3/02)

INTERPRETATIONS

Management objective:	- non-commercial at this time.
Concerns:	- fragile ecosystems; easily damaged
Logging:	- avoid logging
Site preparation:	
Objectives	- maintain organic layers; prepare site for natural regeneration; control mistletoe; remove undesirable advance regeneration (Hw)
Mechanical	- drag scarification
Prescribed fire	- do not burn
Species choice:	
Preferred	- Pl
Brush hazard:	- low
Silviculture applications:	- if this ecosystem is contained within a treatment unit, clearcut to remove Hw seed source. - planting is probably not justified because of the very low productivity of the sites. - let sites regenerate naturally.
Silviculture problems:	- very fragile ecosystem with low productivity. - will likely take a long time to regenerate if logged, so could have a large impact if located in a visual corridor. - do not burn.

ICHwk3 03

HW - BUNCHBERRY

Acer glabrum

Chimaphila umbellata

Pleurozium schreberi

VEGETATION

Tree Layer: 50% cover
Western redcedar, western hemlock, hybrid white spruce, subalpine fir

Shrub Layer: 15% cover

Acer glabrum	(Douglas maple)
Ribes lacustre	(black gooseberry)
Amelanchier alnifolia	(Saskatoon)
Spiraea betulifolia	(birch-leaved spirea)
western redcedar	
western hemlock	

Herb Layer: 15% cover

Chimaphila umbellata	(prince's pine)
Gymnocarpium dryopteris	(oak fern)
Smilacina racemosa	(false Solomon's-seal)
Orthilia secunda	(one-sided wintergreen)
Clintonia uniflora	(queen's cup)
Disporum hookeri	(Hooker's fairybells)

Moss Layer: 50% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	subxeric
Nutrient Regime:	poor - medium
* Aspect:	usually SE - SW
* Slope Gradient (%):	72 (55-82)
* Slope Position:	upper
Parent Material:	colluvial and steep lacustrine
Soil Texture:	moderately fine - moderately coarse
Coarse Fragments (%):	28 (0-84; greater than 50 if non-lacustrine)
Site Index:	Sx 23 (21-26)

COMMENTS
This ecosystem could occur on other parent materials within the subzone.

DISTRIBUTION: uncommon

ww - BUNCHBERRY (ICHwk3/03)

INTERPRETATIONS

Management objectives:
- manage for Fd sawlogs on a 100-year rotation.
- salvage before rehabilitation.

Concerns:
- moisture deficits

Logging:
- clearcut

Site preparation:

Objectives
- maintain organic layers; reduce debris; control mistletoe; remove undesirable advance regeneration (Hw, Bl)

Mechanical
- slopes generally prohibitive

Prescribed fire
- once rehabilitated, site should have light spring burn to remove litter

Species choice:

Preferred
- Fd

Acceptable
- Pl

Brush hazard:
- low

Silviculture applications:
- maintain Cw at up to 300 stems per hectare
- during site preparation, attempt to retain F and H horizons.
- if possible, attempt to obtain natural Fd regeneration.
- plant before mid-June.
- site does not justify any intensive silviculture treatments under present-day criteria.

Silviculture problems:
- these sites occupy very steep sidehills where access is difficult.
- moisture deficits are enhanced by the steepness of these sites.
- control of burning will be very difficult.

ICHwk3/04

HW - STEP MOSS

Menziesia ferruginea

Chimaphila umbellata

Hylocomium splendens

VEGETATION

Tree Layer: 80% cover
Western hemlock, Douglas-fir

Shrub Layer: 35% cover

Menziesia	ferruginea	(false azalea)
Vaccinium	ovalifolium	(oval-leaved blueberry)
western hemlock		
western redcedar		
subalpine fir		

Herb Layer: 10% cover

Cornus	canadensis	(bunchberry)
Chimaphila	umbellata	(prince's pine)
Orthilia	secunda	(one-sided wintergreen)
Clintonia	uniflora	(queen's cup)
Gaultheria	hispidula	(creeping-snowberry)
Goodyera	oblongifolia	(rattlesnake-plantain)

Moss Layer: 100% cover

Hylocomium	splendens	(step moss)
Pleurozium	schreberi	(red-stemmed feathermoss)
Ptilium	crista-castrensis	(knight's plume)
Peltigera	spp.	
Cladina	mitis	
Barbilophozia	spp.	

SOIL AND SITE

Moisture Regime:	subxeric - submesic
Nutrient Regime:	medium - rich
Slope Gradient (%):	7 (5-8)
* Slope Position:	crest - upper
Parent Material:	lacustrine veneer or blanket over bedrock
* Soil Texture:	fine and moderately fine
Coarse Fragments (%):	9 (3-15)
Site Index:	Fd 19

COMMENTS
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare

HW - STEP MOSS (ICHWk3/04)

INTERPRETATIONS

Management objectives:	- usually found with 01(b) association. - manage for Fd sawlogs on a 90-year rotation. - very rare association.
Concerns:	- frost heaving - moisture deficits - soil compaction
Logging:	- clearcut
Site preparation:	
Objectives	- maintain organic layers; reduce debris; control mistletoe; remove undesirable advance regeneration (Pw, Bl)
Mechanical	- drag scarification where feasible
Prescribed fire	- once rehabilitated, site should have light spring burn to remove litter
Species choice:	
Preferred Acceptable	- Fd - Pl
Brush hazard:	- low (false azalea)
Silviculture applications:	- plant before mid-June.
Silviculture problems:	- when this ecosystem does occur, it is usually on the upper slope or crest position. - this association occurs on a thin lacustrine veneer over bedrock and is subject to serious erosion if not harvested carefully.

ICHwk3 05(a)

CW - DEVIL'S CLUB, COARSE-TEXTURED

Oplopanax horridus

Gymnocarpium dryopteris

Dryopteris assimilis

VEGETATION

Tree Layer: 85% cover
Western redcedar, western hemlock, hybrid white spruce, (subalpine fir)

Shrub Layer: 75% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Acer glabrum	(Douglas maple)
western redcedar	
western hemlock	

Herb Layer: 75% cover

Gymnocarpium dryopteris	(oak fern)
Dryopteris assimilis	(spiny wood fern)
Tiarella unifoliata	(one-leaved foamflower)
Tiarella trifoliata	(three-leaved foamflower)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Goodyera oblongifolia	(rattlesnake-plantain)
Streptopus roseus	(rosy twistedstalk)
Galium triflorum	(sweet-scented bedstraw)
Circaea alpina	(enchanter's nightshade)
Athyrium filix-femina	(lady fern)

Moss Layer: 75% cover

Mylocomium splendens	(step moss)
Mnium spp.	(leafy mosses)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime:	subhygric
Nutrient Regime:	poor - medium
Slope Gradient (%):	12 (0-54)
* Slope Position:	lower - level
* Parent Material:	fluvial, colluvial and morainal
Soil Texture:	medium - coarse
Coarse Fragments (%):	38 (0-65)
Site Index:	Cw 28 Sx 28 (26-30)

DISTRIBUTION: common

CW - DEVIL'S CLUB, COARSE-TEXTURED (ICHmk3/05(a))

INTERPRETATIONS

Management objectives:	- manage for Sx sawlogs on a 65- or 70-year rotation.
Concerns:	- windthrow in Sx
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce heavy slash; prepare planting spots; minimize future brush competition; improve planter access
Mechanical	- mounding may be useful on medium-textured soils; V-plows on coarse-textured soils when the soils are dry; FMC with 6-way blade on steeper slopes
Prescribed fire	- broadcast burn (remove L and F horizons) or windrow and burn within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Sx
Acceptable	- Cw
Brush hazard:	- high (devil's club, thimbleberry, fireweed)
Silviculture applications:	- accept and maintain Cw component. - use large planting stock. - wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth. - if considering a commercial thin, plant an additional 200 stems per hectare.
Silviculture problems:	- high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.

ICHwk3/05(b)

CW - DEVIL'S CLUB, FINE - TEXTURED

Oplopanax horridus

Gymnocarpium dryopteris

Dryopteris expansa

VEGETATION

Tree Layer: 65% cover
Western redcedar, western hemlock, hybrid white spruce, (subalpine fir)

Shrub Layer: 75% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Acer glabrum	(Douglas maple)
western redcedar	
western hemlock	

Herb Layer: 75% cover

Gymnocarpium dryopteris	(oak fern)
Dryopteris expansa	(spiny wood fern)
Tiarella unifoliata	(one-leaved foamflower)
Tiarella trifoliata	(three-leaved foamflower)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Goodyera oblongifolia	(rattlesnake-plantain)
Streptopus roseus	(rosy twistedstalk)
Galium triflorum	(sweet-scented bedstraw)
Circaea alpina	(enchanter's nightshade)
Athyrium filix-femina	(lady fern)

Moss Layer: 75% cover

Hylocomium splendens	(step moss)
Mnium spp.	(leafy mosses)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime:	subhygric
Nutrient Regime:	medium - rich
Slope Gradient (%):	usually 0
* Slope Position:	lower - level
* Parent Material:	lacustrine
Soil Texture:	medium - fine
Coarse Fragments (%):	usually 0

COMMENTS:
Limited data for fine-textured phase.

DISTRIBUTION: common

CW - DEVIL'S CLUB, FINE-TEXTURED (ICHmk3/05(b))

INTERPRETATIONS

Management objective: - manage for Sx sawlogs on a 65- or 70-year rotation.

Concerns: - high windthrow hazard
- soil compaction

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce heavy slash; prepare planting spots; minimize future brush competition; improve planter access; avoid soil compaction

Mechanical - mounding may be useful on medium-textured soils; FMC with 6-way blade on steeper slopes

Prescribed fire - broadcast burn (remove L and F horizons) or windrow and burn within 1 year of harvesting, or brown and burn

Species choice:

Preferred - Sx
Acceptable - Cw

Brush hazard: - high (devil's club, thimbleberry, fireweed)

Silviculture applications: - accept and maintain Cw component.
- use large planting stock.
- wide screefing (30 cm X 30 cm) will be beneficial for seedling survival and growth.
- windthrow hazard negates commercial thinning options.

Silviculture problems: - high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.

ICHwk3 06(a)

CW - DEVIL'S CLUB - HORSETAIL, FLUVIAL

Oplopanax horridus

Lonicera involucrata

Equisetum arvense

VEGETATION

Tree Layer: 70% cover
Hybrid white spruce, subalpine fir, paper birch, (black cottonwood, trembling aspen, western redcedar)

Shrub Layer: 60% cover

Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush-cranberry)
[Sambucus racemosa	(red elderberry)]
paper birch	
hybrid white spruce	

Herb Layer: 65% cover

Athyrium filix-femina	(lady fern)
Circaea alpina	(enchanter's nightshade)
Equisetum arvense	(common horsetail)
Aralia nudicaulis	(wild sarsaparilla)
Viola spp.	(violets)
Dryopteris assimilis	(spiny wood fern)
Gymnocarpium dryopteris	(oak fern)

Moss Layer: 80% cover

Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Mnium spp.	(leafy mosses)
Hylocomium splendens	(step moss)

SOIL AND SITE

Moisture Regime:	Hygric
Nutrient Regime:	poor - medium
Slope Gradient (%):	0
* Slope Position:	lower - level
* Parent Material:	fluvial
Soil Texture:	medium - coarse
Coarse Fragments (%):	0
* Seepage Water:	may be present; fluctuating water table
Site Index:	Sx 27 (24-31) Ba 31 (30-33)

DISTRIBUTION: UNCOMMON

CW - DEV[L'S CLUB - HORSETAIL, FLUVIAL (ICHmk3/04(a))]

INTERPRETATIONS

Management objectives	- manage for Sx sawlogs on a 65- or 70-year rotation. - protect the high fisheries and wildlife values.
Concerns:	- cottonwood competition - water table near surface - frost pockets - high fish and wildlife value - high erosion potential
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; prepare planting spots above a high water table; minimize future brush competition
Mechanical	- trafficability will usually be limiting; mounding may be feasible on medium-textured soils
Prescribed fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Sx
Brush hazard:	- very high (devil's club, black twinberry, thimbleberry, lady fern)
Silviculture applications:	- maintain Cw at up to 300 stems per hectare - remove cottonwood seed source. - plant in mid-summer after water table drops. - use large planting stock. - juvenile spacing or conifer release of Sx from cottonwood overstory likely required at age 10 years.
Silviculture problems:	- very high brush competition will require a seed tree control program and inspection of harvested sites at time periods 2 and 4 years after planting. - these inspections may indicate a need for further conifer release projects.

ICHwk3 06(b)

CW- DEVIL'S CLUB - HORSETAIL, LACUSTRINE

Oplopanax horridus

Lonicera involucrata

Equisetum arvense

VEGETATION

Tree Layer: 70% cover
Hybrid white spruce, subalpine fir, paper birch, (black cottonwood, trembling aspen, western redcedar)

Shrub Layer: 60% cover

Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush-cranberry)
[Sambucus racemosa	(red elderberry)]
paper birch	
hybrid white spruce	

Herb Layer: 65% cover

Athyrium filix-femina	(lady fern)
Circaea alpina	(enchanter's nightshade)
Equisetum arvense	(common horsetail)
Aralia nudicaulis	(wild sarsaparille)
Viola spp.	(violets)
Dryopteris assimilis	(spiny wood fern)
Gymnocarpium dryopteris	(oak fern)

Moss Layer: 80% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Mnium spp.	(leafy mosses)
Hylocomium splendens	(step moss)

SOIL AND SITE

Moisture Regime:	hygric
Nutrient Regime:	rich - very rich
Slope Gradient (%):	4 (0-7)
* Slope Position:	lower - level
* Parent Material:	lacustrine
Soil Texture:	moderately fine - fine
Coarse Fragments (%):	0
* Seepage Water:	usually present
Site Index:	Bl 24 Cw 23 Sx 28 (27-30)

COMMENTS:
These ecosystems usually occur near boundaries with the SBSg (undifferentiated) subzone.

DISTRIBUTION: uncommon

CW - DEVIL'S CLUB - HORSETAIL, LACUSTRINE (ICHWk3/06(b))

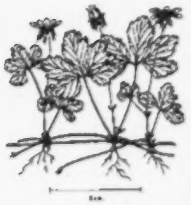
INTERPRETATIONS

Management objectives:	- manage for Sx sawlogs on a 70-year rotation. - protect the high fisheries and wildlife values.
Concerns:	- slope instability - cottonwood competition - water table near surface - frost pockets - soil compaction - high erosion potential - high fish and wildlife values
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; elevate seedlings above water table; minimize future brush competition; avoid soil compaction
Mechanical	- usually not possible without unacceptable soil compaction
Prescribed fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Sx
Brush hazard:	- very high (devil's club, black twinberry, thimbleberry, lady fern)
Silviculture applications:	- maintain Cw at up to 300 stems per hectare. - remove cottonwood seed source. - plant in mid-summer after water table drops. - use large planting stock. - juvenile spacing or conifer release of Sx from cottonwood overstory likely required at age 10 years.
Silviculture problems:	- very high brush competition will require a seed tree control program and inspection of harvested sites at time periods 2 and 4 years after planting. - these inspections may indicate a need for further conifer release projects.

ICHwk3 07

CW - HORSETAIL - SPHAGNUM

Opleopanax horridus



Rubus pedatus

Equisetum sylvaticum

VEGETATION

Tree Layer: 65% cover
Western hemlock, hybrid white spruce, subalpine fir

Shrub Layer: 25% cover

Vaccinium ovalifolium	(oval-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
Menziesia ferruginea	(false azalea)
western hemlock	
subalpine fir	

Herb Layer: 60% cover

Equisetum sylvaticum	(wood horsetail)
Rubus pedatus	(five-leaved bramble)
Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
Lycopodium annotinum	(stiff club-moss)
Athyrium filix-femina	(lady fern)
Dryopteris assimilis	(spiny wood fern)
Linnaea borealis	(twinflower)
Streptopus roseus	(rosy twistedstalk)

Moss Layer: 95% cover

Sphagnum spp.	(sphagnum)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime:	hygric
Nutrient Regime:	poor - medium
* Slope Gradient (%):	1 (0-5)
* Slope Position:	level
* Parent Material:	lacustrine
Soil Texture:	moderately fine - fine
Coarse Fragments (%):	3 (0-16)
* Seepage Water:	present
Site Index:	

DISTRIBUTION: common

CW - HORSETAIL - SPHAGNUM (ICHwk3/07)

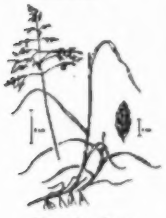
INTERPRETATIONS

Management objective:	- manage for Sx sawlogs on a 100-year rotation.
Concerns:	- high water table - cold soils - soil compaction - high windthrow - poor trafficability
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; elevate seedlings above water table
Mechanical	- usually limited by trafficability
Prescribed Fire	- broadcast burn (remove L and F horizons) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Sx
Acceptable	- Cw
Brush hazard:	- low/moderate (false azalea, lady fern)
Silviculture applications:	- use large planting stock. - plant on existing mounds.
Silviculture problems:	- cold soils and high water table lower the productivity of these sites.

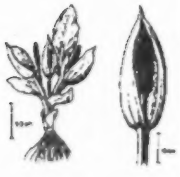
ICHwk3 08

MOUNTAIN ALDER - SKUNK CABBAGE

Alnus incana ssp. tenuifolia



Glyceria elata



Lysichiton americanum

VEGETATION

Tree Layer: 30% cover
Western redcedar, western hemlock, hybrid white spruce, subalpine fir

Shrub Layer: 50% cover

Alnus incana ssp. tenuifolia	(mountain alder)
Vaccinium ovalifolium	(oval-leaved blueberry)
Lonicera involucrata	(black twinberry)
Menziesia ferruginea	(false azalea)
Ribes lacustre	(black gooseberry)
Viburnum edule	(highbush cranberry)
western redcedar	
western hemlock	
subalpine fir	

Herb Layer: 50% cover

Glyceria elata	(tall mannagrass)
Lysichiton americanum	(skunk cabbage)
Thelypteris phegopteris	(beach fern)
Carex disperma	(soft-leaved sedge)
Equisetum arvense	(common horsetail)

Moss Layer: 95% cover

Mnium spp.	(leafy mosses)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Calliergon spp.	
Drepanocladus spp.	

SOIL AND SITE

Moisture Regime:	subhydric
Nutrient Regime:	rich - very rich
* Slope Gradient (%):	0 (0-2)
* Slope Position:	depression
Parent Material:	fluvial and lacustrine
Soil Texture:	variable
Coarse Fragments (%):	0
Seepage Water:	present; water table near surface

COMMENTS
Limited data as the ecosystem is rare. Occurs in narrow drainage channels.

DISTRIBUTION: rare

MOUNTAIN ALDER - SKUNK CABBAGE (1Cbwk3/00)

INTERPRETATIONS

Management objective:	- non-commercial at this time.
Concerns:	- high water table - unproductive ecosystems for forestry
Logging:	- avoid logging

ICHwk3 09

INE - SPHAGNUM

VEGETATION

: 10% cover
Tree Layerpruce, lodgepole pine
Black s
:: 30% cover
Shrub Layeroenlandicum (Labrador tea)
Ledum glandulosa (scrub birch)
Betula le pine
lodgepoeruce
black sheniock
western
: 50% cover
Herb Layerpp. (sedges)
Carex sp oxycoccos (bog cranberry)
Vaccinium olifolia (bog rosemary)
Andromeda angustifolium (narrow-leaved cotton-grass)
Eriophorum chamissonis (Chamisso's cotton-grass)
Eriophoria hiapidula (creeping-snowberry)
Gaulthe rotundifolia (round-leaved sundew)
Drosera
: 95% cover
Moss Layer spp. (sphagnum)
Pleuroz Schreberi (red-stemmed feathermoss)

Ledum groenlandicum

Carex spp.

Sphagnum spp.

SOIL AND SITE

Regime: subhydric
Moistur Regime: very poor - medium
Nutrien adiant (%): 0
Slope C sition: level - depression
Slope P aterial: lacustrine, organic, and organic veneer over lacustrine
Parent
cture: fibric and mesic
Soil Te ragments (%): 5
Coarse able: close to surface
Water T

COMMENTS g ecosystems are variable, differing in the
These b organic material and the "richness" of the
depth o wing through the site. Most of the bogs are in
water m depressions over lacustrine material.
shallow

DISTRIBUTI : uncommon

PINE - SPHAGNUM (ICHwk3/09)

INTERPRETATIONS

Management objective:	- non-commercial at this time.
Concerns:	- high windthrow - soil compaction - frost heaving - high water table
Logging:	- clearcut
Site preparation:	
Objective	- elevate seedlings above the water table
Mechanical	- frost will not usually penetrate soil, so mechanized site preparation will be unreliable
Prescribed fire	
Species choice:	
Preferred	- Sx
Acceptable	- Pl
Brush hazard:	- very high
Silviculture applications:	- this association will likely be an inclusion within a treatment unit; if so, remove seed sources of Hw and alder and plant Sx on drier microsites (i.e., mounds). - Pl will regenerate naturally on many of these sites - water table will likely rise above the ground surface in the spring causing seedling mortality. - use large planting stock.
Silviculture problems:	- is critical to the control of runoff and streamflow.

7 THE SBSdh SUBZONE

Figure 8. Geographic location of the SBSdh subzone in the Prince George Forest Region.

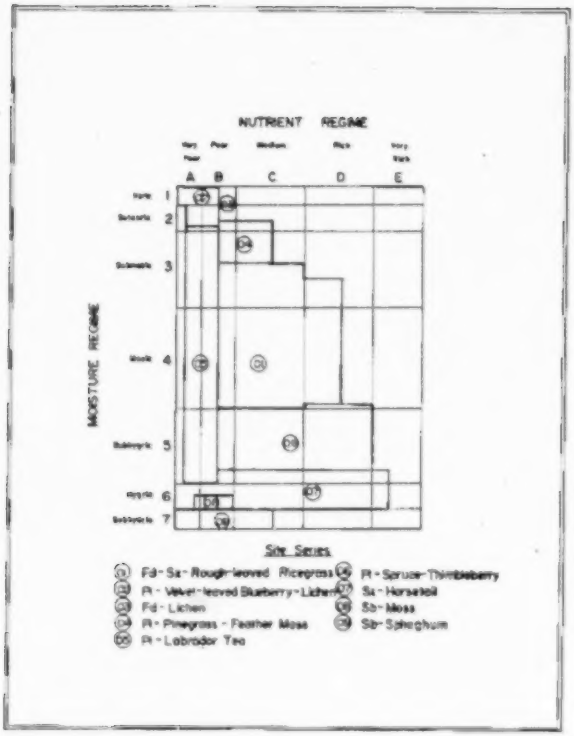


FIGURE 9. Edatopic grid for the SBSdh subzone

KEY TO SITE UNITS OF THE HOYLE

1a Black spruce dominant in canopy; organic soils; water table close to surface

2a Betula similiscana (p. 8)* usually absent; moss layer dominated by feathermosses (pp. 61-62)

BSbl/01

2b Betula glandulosa usually present; moss layer dominated by sphagnum mosses (p. 63)

BSsh/02

1b Black spruce not dominant in canopy; mineral soils; water table variable

3a Level, fluvial deposit; close to stream; seepage water often present; hybrid white spruce or spruce-cottonwood canopy; high shrub and herb cover; Equisetum spp. (p. 24)* moderate to high cover (>10%)

SBSdh/07

3b Not as above

4a Canopy dominated by a single species

5a Main canopy all lodgepole pine or with minor (<5%) Douglas-fir

6a Level; high cover (usually>10%) of Ledum groenlandicum (p. 9)

PIBSm/05

6b Slope position variable; Ledum groenlandicum low cover (<2%) or absent

7a Shepherdia canadensis (p. 13) high cover (>15%), moss layer dominated by feathermosses

PIBSm/04

7b Shepherdia canadensis (p. 13) low cover (<2%) or absent, moss layer dominated by lichens

PIBSm/02

5b Main canopy dominated by Douglas-fir or hybrid white spruce

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982)

8a Main canopy dominated by Douglas-fir

9a Steep slope (>50%); mid- to upper slope; southeast to southwest aspect; moderate cover (usually>10%) of lichens

PSF9h/01

9b Slope usually less than 50%; mid-slope, or lower to level and coarse-textured; lichens low cover (<2%) or absent

PSF5h/01

8b Main canopy all hybrid white spruce (or may contain trembling aspen)

10a Lower slope to level; moderate to high shrub cover (>30%) dominated by Rubus parviflorus (p. 12), Cornus sericea (p. 8), Viburnum edule (p. 15), and Lonicera involucrata (p. 9)

PSF6h/06

10b Often mid-slope; low to moderate shrub cover (<30%) dominated by Spiraea betulifolia (p. 13) and Rosa acicularis (p. 11)

PSF4h/01

4b Main canopy mixed (lodgepole pine, Douglas-fir, hybrid white spruce, subalpine fir)

11a Steep slope (>50%), mid- to upper slope; southeast to southwest aspect; moderate cover (>10%) of lichens

PSF6h/03

11b Slope usually less than 50%; various slope positions; various aspects; lichens low cover (usually <5%) or absent

12a Level, or mid- to upper slope; moderate to high cover (usually >3%) of Shepherdia canadensis

PSF5h/04

12b Level, or mid- to lower slope; Shepherdia canadensis low cover (<5%) or absent

13a Lower slope to level; moderate to high shrub cover (>30%) dominated by Rubus parviflorus, Cornus sericea, Viburnum edule, and Lonicera involucrata

PSF6h/04

13b Often mid-slope; low to moderate shrub cover (<30%) dominated by Spiraea betulifolia and Rosa acicularis

PSF5h/01

SBSdh/01

FD - SX - ROUGH-LEAVED RICEGRASS

Spiraea betulifolia

Chimaphila umbellata

Pleurozium schreberi

VEGETATION

Tree Layer: 65% cover
Douglas-fir, lodgepole pine, (hybrid white spruce)

Shrub Layer: 20% cover

Spiraea betulifolia	(birch-leaved spirea)
Rosa acicularis	(prickly rose)
Rubus parviflorus	(thimbleberry)
Viburnum edule	(highbush-cranberry)
Amelanchier alnifolia	(saskatoon)
subalpine fir	

Herb Layer: 50% cover

Orthilia secunda	(one-sided wintergreen)
Chimaphila umbellata	(prince's pine)
Linnaea borealis	(twinflower)
Goodyera oblongifolia	(rattlesnake plantain)
Smilacina racemosa	(false Solomon's-seal)
Pyrola chlorantha	(green wintergreen)
Cornus canadensis	(bunchberry)
Aralia nudicaulis	(wild sarsaparilla)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Maianthemum canadense	(wild lily-of-the-valley)

Moss Layer: 45% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail) moss)
Hylocomium splendens	(step moss)
Dicranum polysetum	

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	poor - rich
* Slope Gradient (%):	15 (0-33)
Slope Position:	variable
Parent Material:	commonly fluvial or morainal
* Soil Texture:	medium - coarse
Coarse Fragments (%):	38 (0-77)
Site Index:	Bl 31 (27-38)
	Fd 30 (26-36)
	Pl 30 (25-35)
	Sx 30 (21-35)

COMMENTS:
Coarse-textured soils on toe to level slope positions. Medium to moderately coarse-textured soils on mid-slope positions.

DISTRIBUTION: common

FD - 6X - ROUGH-LEAVED @ICHORAsH (SBSdh/01)

INTERPRETATIONS

Management objective:
- Manage for Fd sawlogs on an 80-year rotation.

Concerns:
- deer browse
- moisture deficit

Logging:
- two-pass system
- clearcut (small clearcut in visually sensitive areas)
- clearcut with seed tree

Site preparation:

Objectives
- reduce slash; improve planter access; site preparation may not be required

Mechanical
- drag scarification

Prescribed fire
- light broadcast burn (remove L and F horizons) or windrow and burn

Species choice:

Preferred
- Fd

Acceptable
- Pl

Brush hazard:
- low/moderate (pinegrass, fireweed)

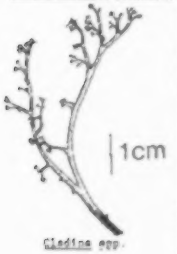
Silviculture applications:
- leave 20-50 genetically superior seed trees per hectare if using the seed tree option.
- use the two-pass system only when visual impact or recreation values warrant (this system recommended for Mt. Robson corridor and Mt. Terry Fox).
- expect natural regeneration of Fd and Pl.
- overstocking of Fd or Pl may occur; if so, may need to juvenile space 10 years after harvesting.

Silviculture problems:
- do not use skidders if adopting the two-pass system because of soil compaction problems.
- supervision of contractors mandatory if the two-pass system is to work.
- horse logging, small cat or cable system may need to be used to protect residual stems.
- mistletoe clauses may be required.

SBSdh02

PL - VELVET - LEAVED BLUEBERRY - LICHEN

Arctostaphylos uva-ursi



Cladina spp.

Peltigera spp.

VEGETATION

Tree Layer: 35% cover
Lodgepole pine

Shrub Layer: 15% cover
Vaccinium myrtilloides (velvet-leaved blueberry)
lodgepole pine

Herb Layer: 20% cover
Arctostaphylos uva-ursi (kinnikinnick)
Melampyrum lineare (cow-wheat)

Moss Layer: 60% cover
Cladina spp.)
Peltigera spp.) - lichens
Cladonia spp.)
Dicranum polysetum (wavy-leaved moss)
Pleurozium schreberi (red-stemmed feathermoss)

SOIL AND SITE

Moisture Regime:	xeric (- submesic)
Nutrient Regime:	very poor - poor
Slope Gradient (%):	7 (0-15)
Slope Position:	variable
* Parent Material:	glaciofluvial or eolian
* Soil Texture:	coarse
Coarse Fragments (%):	16 (0-60)
Site Index:	Pl 20 (17-24)

COMMENTS
Moss layer of these sites is dominated by lichens.

DISTRIBUTION: common

FL - VELVET-LEAVED BLUEBERRY - LICHEN (SS84b/02)

INTERPRETATIONS

Management objectives: - non-commercial at this time.
- eolian deposits are the most common parent materials underlying these sites.
- logging could initiate dune movement.

Concerns: - extreme moisture deficit

Logging: - avoid logging

SBSdh03

FD-LICHEN

Calamagrostis rubescens

Peltigera spp.

Elymus innovatus

VEGETATION

Tree Layer: 50% cover
Douglas-fir, lodgepole pine

Shrub Layer: 15% cover

Spiraea betulifolia	(birch-leaved spirea)
Shepherdia canadensis	(soopolallie)
Rosa acicularis	(prickly rose)
Alnus viridis ssp. sinuata	(Sitka alder)
Douglas-fir	

Herb Layer: 20% cover

Calamagrostis rubescens	(pinegrass)
Arctostaphylos uva-ursi	(kinnikinnick)
Solidago spathulata	(spike-like goldenrod)
Aster conspicuus	(showy aster)
Campanula rotundifolia	(common harebell)
(Elymus innovatus	(fuzzy-spiked wildrye);

Moss Layer: 35% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum polysetum	(wavy-leaved moss)
Ptilium crista-castrensis	(knight's plume)
Polytrichum juniperinum	(juniper haircap moss)
Cladina spp.	

SOIL AND SITE

Moisture Regime:	xeric - subxeric
Nutrient Regime:	poor
* Aspect:	southerly
* Slope Gradient (%):	66 (50-75)
* Slope Position:	mid- to upper
Parent Material:	colluvial or (glacio)fluvial
* Soil Texture:	coarse - medium
Coarse Fragments (%):	52 (0-80)
Site Index:	FD 22 (18-26)
	Pl 21 (19-24)

DISTRIBUTION: rare

PD - LICHEN (SBSdh/03)

INTERPRETATIONS

Management objectives:
- reserved for wildlife.
- class 1 wildlife lands.
- represents critical wintering grounds.
- this is a rare association in this subzone and occurs as small pockets on very steep terrain.

Logging:
- avoid logging

SBSdh 04

PL - PINEGRASS - FEATHERMOSS

Shepherdia canadensis

Linnaea borealis

Elymus innovatus

VEGETATION

Tree Layer: 45% cover
Lodgepole pine, Douglas-fir

Shrub Layer: 35% cover

Shepherdia canadensis	(soopolallie)
Spiraea betulifolia	(birch-leaved spirea)
Vaccinium myrtilloides	(velvet-leaved blueberry)
Rosa acicularis	(prickly rose)
Amelanchier alnifolia	(saskatoon)
Douglas-fir	

Herb Layer: 50% cover

Linnaea borealis	(twinflower)
Chimaphila umbellata	(prince's pine)
Cornus canadensis	(bunchberry)
Maianthemum canadense	(wild lily-of-the-valley)
Orthilia secunda	(one-sided wintergreen)
Goodyera oblongifolia	(rattlesnake-plantain)
Arctostaphylos uva-ursi	(kinnikinnick)
Elymus innovatus	(fuzzy-spiked wildrye)
Melampyrum lineare	(cow-wheat)
Oryzopsis asperifolia	(rough-leaved ricegrass)

Moss Layer: 80% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum polysetum	(wavy-leaved moss)

SOIL AND SITE

Moisture Regime:	subxeric - submesic
Nutrient Regime:	poor (- medium)
Slope Gradient (%):	3 (0-14)
* Slope Position:	mid- to upper, or level
Parent Material:	(glacio)fluvial, morainal
* Soil Texture:	moderately coarse - coarse
Coarse Fragments (%):	30 (0-85)
Site Index:	Fd 26 (24-28)
	Pl 24 (22-28)
	Sx 32

DISTRIBUTION: very common

Pl - PINEGRASS - FEATHERMOSS (SBSdh/04)

INTERPRETATIONS

Management objective:	- manage for Pl sawlog on a 90-year rotation.
Concerns:	- deer browse - dwarf mistletoe - high moisture deficits
Logging:	- clearcut - selective logging - two-pass system - clearcut with seed tree
Site preparation:	
Objectives	- maintain organic layers; reduce debris; prepare site for natural regeneration
Mechanical	- drag scarify if winter logged
Prescribed fire	
Species choice:	
Preferred	- Pl, Fd
Brush hazard:	- low (fireweed, pine grass)
Silviculture applications:	- leave 30-50 genetically superior seed trees per hectare if using the seed tree option. - use the two-pass system only when visual impact or recreation values warrant (this system recommended for Mt. Robson corridor and Mt. Terry Fox). - drought level duration could result in serious seedling mortality. - complete planting by mid-June. - range values are moderate to high on these sites. - practice dwarf mistletoe control techniques. - fall all Pl over 1 m to reduce dwarf mistletoe infection of new stand.

PL - LABRADOR TEA

Ledum groenlandicum

Vaccinium vitis-idaea

Oxycoccus oxycoccos

VEGETATION

Tree Layer:	50% cover	
Lodgepole pine		
Shrub Layer:	65% cover	
Ledum groenlandicum		(Labrador tea)
Vaccinium myrtilloides		(velvet-leaved blueberry)
Shepherdia canadensis		(soopolallie)
Salix spp.		(willows)
Rosa acicularis		(prickly rose)
Spirea betulifolia		(birch-leaved spirea)
lodgepole pine		
trembling aspen		
hybrid white spruce		
Herb Layer:	50% cover	
Vaccinium vitis-idaea		(lingonberry)
Cornus canadensis		(bunchberry)
Arctostaphylos uva-ursi		(kinnikinnick)
Linnaea borealis		(twinflower)
Lycopodium annotinum		(stiff clubmoss)
Melampyrum lineare		(cow-wheat)
Oxycoccus oxycoccos		(bog cranberry)
Pyrola asarifolia		(pink wintergreen)
Moss Layer:	95% cover	
Pleurozium schreberi		(red-stemmed feathermoss)
Peltigera spp.		(pelt lichens)
Cladina spp.		(reindeer lichens)
Hylocomium splendens		(step moss)

SOIL AND SITE

Moisture Regime:	(subxeric -) submesic - mesic
Nutrient Regime:	very poor - poor
Slope Gradient (%):	1 (0-2)
Parent Material:	level
Soil Texture:	fluvial
Coarse Fragments (%):	coarse
Site Index:	1 (0-2)
	Pl 25.5 (25-26)

DISTRIBUTION: uncommon

PL - LABRADOR TRA (088dh/05)

INTERPRETATIONS

Management objective:	- manage for Pl pulplogs on an 80-year rotation.
Concerns:	- dwarf mistletoe
Logging:	- clearcut
Site preparation:	
Objectives	- prepare site for natural regeneration; control mistletoe
Mechanical	- light drag scarify if winter logged
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low (firewood)
Silviculture applications:	- does not justify any silvicultural investment other than drag scarification. - practice dwarf mistletoe control techniques.

SBSdh06

PL - SX - THIMBLEBERRY

Rubus parviflorus

Cornus sericea

Aralia nudicaulis

VEGETATION

Tree Layer: 65% cover
Hybrid white spruce, Douglas fir, trembling aspen, lodgepole pine, (subalpine fir)

Shrub Layer: 45% cover

Rubus parviflorus	(thimbleberry)
Cornus sericea	(red-osier dogwood)
Viburnum edule	(highbush-cranberry)
Lonicera involucrata	(black twinberry)
Ribes hudsonianum	(black currant)
Spiraea betulifolia	(birch-leaved spirea)
Amelanchier alnifolia	(saskatoon)
hybrid white spruce	
subalpine fir	

Herb Layer: 55% cover

Aralia nudicaulis	(wild sarsaparilla)
Linnaea borealis	(twinflower)
Orthilia secunda	(one-sided wintergreen)
Cornus canadensis	(bunchberry)
Maianthemum racemosa	(false Solomon's-seal)
Maianthemum canadense	(wild lily-of-the-valley)
Galium triflorum	(sweet-scented bedstraw)
Disporum hookeri	(Hooker's fairybells)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Chimaphila umbellata	(prince's pine)
[Clintonia uniflora	(queen's cup)]

Moss Layer: 60% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
[Ptilium crista-castrensis	(knight's plume)]
[Hylocomium splendens	(step moss)]

SOIL AND SITE

Moisture Regime:	(mesic -) subhygric
Nutrient Regime:	poor - rich
* Slope Gradient (%):	5 (0-13)
* Slope Position:	lower to level
Parent Material:	variable
Soil Texture:	variable
Coarse Fragments (%):	15 (0-40)
Seepage Water:	may be present
Site Index:	PW 33 (29-37)
	Pl 29 (26-32)
	Sx 31 (28-36)

DISTRIBUTION: common, especially on sites that receive limited seepage

[illegible] - SE - [illegible] (SBSdh/06)

INTERPRETATIONS

Management objectives: - manage for Pd sawlogs on a 70-year rotation or Sx sawlogs on an 80-year rotation.
- protect wildlife values.

Concerns: - high windthrow hazard
- good moose habitat

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; avoid soil compaction on finer-textured soils

Mechanical - patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 8-way blade on finer-textured soils or steep slopes

Prescribed fire - broadcast burn (remove L horizon)

Species choice:

Preferred - Pd, Sx
Acceptable - Pw

Brush hazard: - moderate to high (thimbleberry, fireweed)

Silviculture applications: - seed tree control of alder and aspen.
- complete planting by mid-June.
- use large planting stock.

Silviculture problems: - high brush competition will likely occur within 2 years of harvesting, so large stock types should be planted immediately after harvesting.
- use of herbicides to help control brush competition may conflict with protection of wildlife values.

SBSdh 07

SX - HORSETAIL

Cornus sericea

Equisetum arvense

Equisetum pratense

VEGETATION

Tree Layer: 65% cover
Hybrid white spruce, (black cottonwood, subalpine fir)

Shrub Layer: 35% cover

Cornus sericea	(red-osier dogwood)
Viburnum edule	(highbush-cranberry)
Lonicera involucrata	(black twinberry)
Rosa acicularis	(prickly rose)
hybrid white spruce	

Herb Layer: 60% cover

Equisetum arvense	(common horsetail)
Equisetum pratense	(meadow horsetail)
Galium triflorum	(sweet-scented bedstraw)
Cornus canadensis	(bunchberry)
Aralia nudicaulis	(wild sarsaparilla)
Smilacina racemosa	(false Solomon's-seal)
Rubus pubescens	(trailing raspberry)
Gymnocarpium dryopteris	(oak fern)

Moss Layer: 30% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
[Pleurozium schreberi	(red-stemmed feathermoss)]

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	medium - very rich
* Slope Gradient (%):	0 (0-2)
* Slope Position:	level
* Parent Material:	fluvial
Soil Texture:	medium - coarse
Coarse Fragments (%):	18 (0-86)
* Seepage Water:	often present
Site Index:	Pl 32 (30-34) Sx 32 (27-37)

COMMENTS
These sites often have a fluctuating water table.

DISTRIBUTION: common, but small in size. Occur along rivers and creeks.

SX - HORSETAIL (5054h/07)

INTERPRETATIONS

Management objectives:
- manage for Sx sawlogs on a 70-year rotation.
- protect high fisheries (salmon) and high wildlife values.

Concerns:
- high salmon and moose values
- good windthrow hazard
- high water table

Logging:
- clearcut

Site preparation:

Objectives
- reduce organic layers; reduce debris; elevate seedlings above water table; minimize future brush competition; improve planter access

Mechanical
- trafficability may be a limiting factor; mound where possible

Prescribed fire
- broadcast burn (remove L horizon) or windrow and burn

Species choice:

Preferred - Sx
Acceptable - Pw

Brush hazard:
- very high

Silviculture applications:
- use of herbicides not recommended.
- seed tree control of alder, willow and cottonwood.
- juvenile spacing or conifer release of Sx from cottonwood overstory likely required at age 10 years.

Silviculture problems:
- very high brush competition will require a seed tree control program and inspection of harvested sites at time periods 2 and 4 years after planting.
- these inspections may indicate a need for further conifer release projects.

SBSdh08

SB-MOSS

Ledum groenlandicum

Carex spp.

Pleurozium schreberi

VEGETATION

Tree Layer: 65% cover
Black spruce, (lodgepole pine)

Shrub Layer: 10% cover

Ledum groenlandicum	(Labrador tea)
Alnus incana ssp. tenuifolia	(mountain alder)
black spruce	

Herb Layer: 25% cover

Carex spp.	(sedges)
Cornus canadensis	(bunchberry)
Equisetum arvense	(common horsetail)

Moss Layer: 95% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)

SOIL AND SITE

Moisture Regime:	hygric (- subhygric)
Nutrient Regime:	poor
Slope Gradient (%):	2
* Slope Position:	depression
* Parent Material:	organic veneer
Coarse Fragments (%):	5
* Water Table:	close to surface

COMMENTS
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare

SS - MOSS (SMSdh/08)

INTERPRETATIONS

Management objectives:	- non-commercial at this time. - very rare association.
Concerns:	- High water table
Logging:	- avoid logging

SB - SPHAGNUM

Betula glandulosa

Ledum groenlandicum

Carex spp.

VEGETATION

Tree Layer: 15% cover
Black spruce

Shrub Layer: 65% cover

Betula glandulosa	(scrub birch)
Ledum groenlandicum	(Labrador tea)
Salix spp.	(willows)
[Juniperus communis	(common juniper)]
black spruce	

Herb Layer: 60% cover

Carex spp.	(sedges)
Vaccinium oxycoccos	(bog cranberry)
Drosera rotundifolia	(round-leaved sundew)
Smilacina trifolia	(three-leaved false Solomon's-seal)
Vaccinium vitis-idaea	(lingonberry)
Rubus arcticus	(dwarf nagoonberry)

Moss Layer: 95% cover

Sphagnum spp.	(sphagnum)
Tomenthypnum nitens	
Aulacomnium palustre	(glow moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Polytrichum spp.	(haircap mosses)

SOIL AND SITE

Moisture Regime:	subhydric
Nutrient Regime:	very poor - poor
* Slope Gradient (%):	0 (0-2)
* Slope Position:	level or depression
Parent Material:	organic
Coarse Fragments (%):	0
* Water Table:	close to surface

DISTRIBUTION: common

SB - SPHAGNUM (SBSCh/09)

INTERPRETATIONS

Management objective:	- non-commercial at this time.
Concerns:	- high water table - unproductive sites for forestry
Logging:	- avoid logging

NOTES

8 THE ESSFb SUBZONE

FIGURE 10. Geographic location of the ESSFb subzone in the Prince George Forest Region.

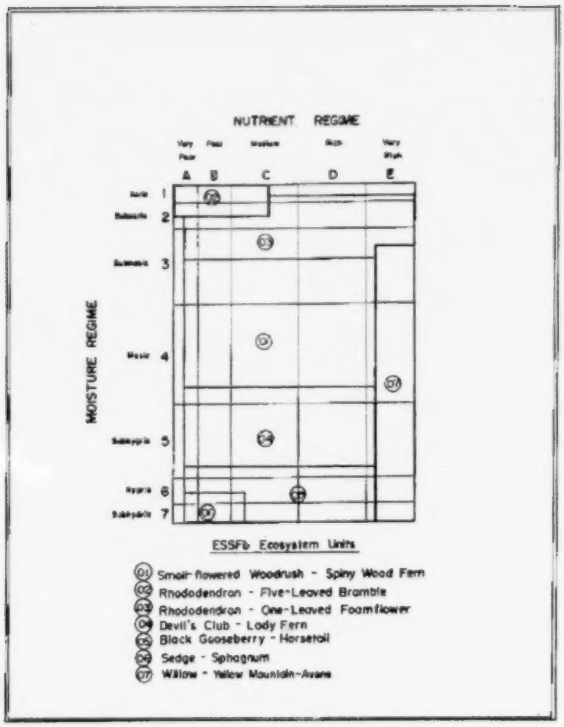


FIGURE 11 Edatopic grid for the ESSFb subzone.

KEY TO SITE UNITS OF THE ESSFb

1a Sites not forested, or with a few scattered trees

2a Rich, often fluvial sites, lower to toe of slope or level; no trees, shrub layer dominated by Shepherdia canadensis (p. 13)* and willows, herb layer with Dryas drummondiana (yellow mountain-avens)

ESSFb/07

2b Poorer sites, often organic soils, level or depression; scattered subalpine fir, shrub layer dominated by mountain hemlock and/or subalpine fir regeneration, herb layer dominated by sedges (pp. 36-38)

ESSFb/06

1b Sites forested

3a Calamagrostis horrida (p. 18) moderate cover (usually>10%); slope position lower to toe

ESSFb/04

3b Calamagrostis horrida low cover (<5%) or absent; slope position variable

4a Toe of slope or level; often by flowing or standing water; herb layer dominated by Equisetum spp. (p. 24)

ESSFb/05

4b Usually mid- to upper slope; Equisetum spp. low cover (<2%) or absent

5a Usually mid-slope; ferns [Gymnocarpium dryopteris (p. 26), Dryopteris assimilis (p. 23) and Athyrium filix-femina (p. 22)] dominate herb layer

ESSFb/01

5b Usually upper slope to crest; ferns low cover (<5%) or absent

6a Upper slope to crest, soils shallow (usually < 50 cm to bedrock); herb layer poorly developed (< 20% cover), Gymnocarpium dryopteris absent

ESSFb/02

6b Upper slope, soils greater than 1 m in depth; herb layer moderately poorly developed (>25% cover), Gymnocarpium dryopteris usually present

ESSFb/03

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

ESSFb 01

SMALL-FLOWERED WOODRUSH - SPINY WOOD FERN

Valeriana sitchensis

Dryopteris assimilis

Luzula parviflora

VEGETATION

Tree Layer: 35% cover
Engelmann spruce, subalpine fir, western hemlock

Shrub Layer: 55% cover

Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Rhododendron albiflorum	(white-flowered rhododendron)
[Menziesia ferruginea	(false azalea)]
subalpine fir	
Engelmann spruce	

Herb Layer: 45% cover

Valeriana sitchensis	(Sitka valerian)
Tiarella unifoliata	(one-leaved foamflower)
Streptopus roseus	(rosy twistedstalk)
Dryopteris assimilis	(spiny wood fern)
Gymnocarpium dryopteris	(oak fern)
Rubus pedatus	(five-leaved bramble)
Luzula parviflora	(small-flowered woodrush)
Veratrum viride	(Indian hellebore)

Moss Layer: 55% cover

Barbilophozia lycopodioides	(common leafy liverwort)
Mnium rugus	
[Pleurozium schreberi	(red-stemmed feathermoss)]
[Brachythecium spp.]	

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	poor - medium
Slope Gradient (%):	25 (0-70)
* Slope Position:	mid; upper if N aspect; lower if coarse-textured
* Soil Texture:	moderately coarse - medium
Coarse Fragments (%):	42 (25-65)
Soil Drainage:	moderately well - well
Humus Thickness (cm):	2-7

DISTRIBUTION: common

SMALL-FLOWERED WOODRUSH - SPINY WOOD FERN (BSSPb/01)

INTERPRETATIONS

Management objective:	- manage for Se sawlogs on an 80-year rotation.
Concerns:	- snowpack; watershed management
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition
Mechanical	- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes
Prescribed fire	- broadcast burn (remove L and F layers) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Se
Acceptable	- Bl
Brush hazard:	- moderate to high (white-flowered rhododendron, fireweed)
Silviculture applications:	- these sites have been selectively logged in the Nelson Region. - accept and maintain Bl component. - harvest sites in the winter. - burn in the summer. - summer planting. - use large planting stock. - brushing and weeding may be required.
Silviculture problems:	- getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer. - moderate to high brush competition will require an inspection of harvested sites 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition. - mechanical site preparation equipment should try to create raised planting spots. - compaction will be a serious problem on lacustrine soils; these sites must be logged during the winter using a good snowpack.

ESSFb 02

RHODODENDRON - FIVE-LEAVED BRAMBLE

Rhododendron albiflorum

Rubus pedatus

Dicranum spp.

VEGETATION

Tree Layer: 25% cover
Subalpine fir, Engelmann spruce, western hemlock

Shrub Layer: 55% cover

Vaccinium membranaceum	(black huckleberry)
Rhododendron albiflorum	(white-flowered rhododendron)
subalpine fir	

Herb Layer: 15% cover

Rubus pedatus	(five-leaved bramble)

Moss Layer: 75% cover

Dicranum fuscescens	(curly heron's-bill moss)

SOIL AND SITE

Moisture Regime:	xeric - subxeric (- submesic)
Nutrient Regime:	very poor - poor
* Slope Position:	crest - upper
Soil Texture:	moderately coarse - medium
* Soil Depth:	usually less than 1 m to bedrock
Slope Gradient (%):	31 (8-65)
Parent Material:	usually morainal or colluvial veneer, rarely organic veneer
* Coarse Fragments (%):	49 (0-80)
* Soil Drainage:	well - rapidly

DISTRIBUTION: UNCOMMON

RHODODENDRON - FIVE-LEAVED BRAMBLE (RHSPb/02)

INTERPRETATIONS

Management objective: - manage for Se analogs on a 90-year rotation.

Concerns: - snowpack; possible moisture deficits

Logging: - clearcut

Site preparation:

Objectives - maintain organic layers; reduce debris; improve planter access; prepare plantable spots

Mechanical - no mechanical site preparation on steep slopes or shallow soils; patch scarifiers can be used (carefully!) on sites with deeper soils

Prescribed fire - broadcast burn (remove L horizon)

Species choice:

Preferred
Acceptable - Se

Brush hazard: - low to moderate (white-flowered rhododendron)

Silviculture applications: - these sites have been selectively logged in the Nelson Region.
- Bl is not an acceptable species on this unit.

Silviculture problems: - steep slopes and coarse, shallow to bedrock soils will lead to moisture deficits and erosion hazards on some sites.

ESSFb 03

RHODODENDRON - ONE-LEAVED FOAMFLOWER

Rhododendron albiflorum

Tiarella unifoliata

Rubus pedatus

VEGETATION

Tree Layer: 65% cover
Engelmann spruce, subalpine fir

Shrub Layer: 50% cover

Vaccinium membranaceum	(black huckleberry)
Rhododendron albiflorum	(white-flowered rhododendron)
Vaccinium ovalifolium	(oval-leaved blueberry)
[Menziesia ferruginea	(False azalea)]
subalpine fir	

Herb Layer: 20% cover

Tiarella unifoliata	(one-leaved foamflower)
Rubus pedatus	(five-leaved bramble)
Valeriana sitchensis	(Sitka valerian)
Gymnocarpium dryopteris	(oak fern)
Streptopus roseus	(rosy twistedstalk)

Moss Layer: 45% cover
Barbilophozia lycopodioides (common leafy liverwort)
[Pleurozium schreberi (red-stemmed feathermoss)]
[Brachythecium hylotapetum]

SOIL AND SITE

Moisture Regime:	subxeric - submesic
Nutrient Regime:	poor - medium
Slope Position:	mid- to upper
Soil Texture:	moderately coarse - coarse
Slope Gradient (%):	23 (8-75)
Soil Drainage:	(moderately well -) well
Humus Thickness (cm):	7 (1-20)

DISTRIBUTION: fairly common

RHODODENDRON - CAPE-LEAVED FOXGLOVE (RDSFb/03)

INTERPRETATIONS

Management objective: - manage for Se sawlogs on an 80-year rotation.

Concerns: - snowpack

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition

Mechanical - patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes

Prescribed fire - broadcast burn (remove L horizon)

Species choice:

Preferred - Se
Acceptable - Bl

Brush hazard: - moderate (white-flowered rhododendron, fireweed)

Silviculture applications: - accept and maintain Bl component.
- these sites have been selectively logged in the Nelson Region.

Silviculture problems: - coarse-textured soils and upper slope positions may lead to moisture deficits on some sites.

ESSFb04

DEVIL'S CLUB - LADY FERN

Oplopanax horridus

Athyrium filix-femina

Gymnocarpium dryopteris

VEGETATION

Tree Layer: 35% cover
Engelmann spruce, subalpine fir

Shrub Layer: 45% cover

Oplopanax horridus	(devil's club)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Ribes lacustre	(black gooseberry)
Menziesia ferruginea	(false azalea)
Rubus parviflorus	(thimbleberry)
subalpine fir	

Herb Layer: 55% cover

Gymnocarpium dryopteris	(oak fern)
Tiarella unifoliata	(one-leaved foamflower)
Streptopus roseus	(rosy twistedstalk)
Athyrium filix-femina	(lady fern)
Dryopteris assimilis	(spiny wood fern)
Valeriana sitchensis	(Sitka valerian)
Galium triflorum	(sweet-scented bedstraw)
Rubus pedatus	(five-leaved bramble)
Streptopus amplexifolius	(clasping twistedstalk)

Moss Layer: 45% cover

Brachythecium spp.	
Mnium nudum	
[Pleurozium schreberi	(red-stemmed feathermoss)]

SOIL AND SITE

Moisture Regime:	mesic - subhygric (- hygric)
Nutrient Regime:	medium - rich
* Slope Position:	lower - toe; mid- if N aspect
Slope Gradient (%):	25 (4-50)
Soil Texture:	medium - moderately coarse (- coarse)
Coarse Fragments(%):	41 (17-85)
Soil Drainage:	(poorly -) imperfectly - well
Humus Thickness (cm):	8 (2-30; rarely more than 10)

DISTRIBUTION: common

DEVIL'S CLUB - LADY FERN (ESSFb/04)

INTERPRETATIONS

Management objective:	- manage for Se sawlogs on a 75-year rotation.
Concerns:	- high brush hazard; watershed management; snowpack; windthrow
Logging:	- clearcut
Site preparation:	
Objective	- reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition
Mechanical	- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes
Prescribed fire	- broadcast burn (remove L and F layers) within 1 year of harvesting, or brown and burn
Species choice:	
Preferred	- Se
Acceptable	- Bl
Brush hazard:	- very high (thimbleberry, devil's club, fireweed, lady fern)
Silviculture applications:	- these sites have been selectively logged in the Nelson Region. - accept and maintain Bl component. - harvest sites in the winter. - summer planting. - use large planting stock. - mechanical site preparation should create raised planting spots.
Silviculture problems:	- getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer. - very high brush competition will require an inspection of harvested sites 2 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition. - before planting there may be a need to use herbicides to reduce brush competiton. - compaction will be a serious problem on lacustrine soils; these sites must be logged during the winter using a good snowpack.

ESSFb 05

BLACK GOOSEBERRY - HORSETAIL

Ribes lacustre

Equisetum arvense

Gymnocarpium dryopteris

VEGETATION

Tree Layer: 30% cover
Engelmann spruce, subalpine fir

Shrub Layer: 45% cover

Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Ribes lacustre	(black gooseberry)
Rhododendron albiflorum	(white-flowered rhododendron)
[Menziesia ferruginea	(false azalea)]
subalpine fir	
Engelmann spruce	

Herb Layer: 70% cover

Tiarella unifoliata	(one-leaved foamflower)
Gymnocarpium dryopteris	(oak fern)
Streptopus amplexifolius	(clasping twistedstalk)
Athyrium filix-femina	(lady fern)
Valeriana sitchensis	(Sitka valerian)
Senecio triangularis	(arrow-leaved groundsel)
Equisetum arvense	(common horsetail)
Streptopus roseus	(rosy twistedstalk)

Moss Layer: 75% cover

Brachythecium spp.	
(Mnium punctatum)	
[Pleurozium schreberi	(red-stemmed feathermoss)]

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	medium - rich
* Slope Position:	toe - level
* Slope Gradient:	9 (0-30)
* Seepage Water:	usually present
Coarse Fragments (%):	40 (0-80)
Parent Material:	usually fluvial or organic
Soil Drainage:	moderately well - poorly
Humus Thickness (cm):	15 (2-73; rarely more than 25)

DISTRIBUTION: common, often occurring as strips along the sides of bodies of water.

BLACK GOOSEBERRY - HORSETAIL (KSSYb/05)

INTERPRETATIONS

Management objective: - manage for Se sawlogs on an 80-year rotation.

Concerns: - snowpack; watershed management; windthrow

Logging: - clearcut

Site preparation:

Objectives - reduce organic layers; reduce debris; elevate seedlings above water table; minimize future brush competition

Mechanical - trafficability is usually a limiting factor; create mounds in medium-textured soils if feasible

Prescribed fire - broadcast burn (remove L and F layers) within 1 year of harvesting, or brown and burn

Species choice:

Preferred - Se
Acceptable - Bl

Brush hazard: - moderate (white-flowered rhododendron, lady fern, fireweed)

Silviculture applications:
- these sites have been selectively logged in the Nelson Region.
- accept and maintain Bl component.
- harvest sites in the winter.
- summer planting.
- use large planting stock.
- brushing and weeding may be required.

Silviculture problems:
- getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer.
- moderate to high brush competition will require an inspection of harvested sites 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition.
- compaction will be a serious problem on lacustrine soils; these sites must be logged during the winter using a good snowpack.

ESSFb06

SEDGE - SPHAGNUM

Carex spp.

Sphagnum spp.

Vaccinium ovalifolium

VEGETATION

Tree Layer: 10% cover
- Subalpine fir

Shrub Layer: 45% cover
- *Vaccinium ovalifolium* (oval-leaved blueberry)
- *Vaccinium membranaceum* (black huckleberry)
- *Rhododendron albiflorum* (white-flowered rhododendron)
- mountain hemlock
- subalpine fir

Herb Layer: 70% cover
- *Carex* spp. (sedges)
- *Veratrum viride* (Indian hellebore)
- *Streptopus roseus* (rosy twistedstalk)
- *Vahlodea atropurpurea* (mountain hairgrass)
- [*Lusitka pectinata* (partridgefoot)]

Moss Layer: 75% cover
- *Barbilophozia floerkei*
- *Sphagnum capillaceum* (common red sphagnum)
- [*Aulacomnium palustre* (glow moss)]
- [*Dicranum* spp.]

SOIL AND SITE:

Moisture Regime:	hygric - subhydric
Nutrient Regime:	poor - very poor
* Slope Position:	toe, level, or depression
Slope Gradient (%):	13 (0-25)
* Seepage Water (cm):	18 (0-70)
Parent Material:	morainal, often capped with organic
Coarse Fragments(%):	25 (10-55)
Soil Drainage:	(well -) imperfectly - poorly
Humus Thickness (cm):	13 (0-45; rarely greater than 26)

DISTRIBUTION: uncommon

SEDGE - SPHAGNUM (RSSPh/06)

INTERPRETATIONS

Management objective: - non-commercial at this time.

ESSFb07

WILLOW - YELLOW MOUNTAIN-AVENS

Salix spp.

Dryas drummondii

Shepherdia canadensis

VEGETATION

Tree Layer: 0% cover

Shrub Layer: 45% cover

Shepherdia canadensis	(soopolallie)
Salix barclayi	(Barclay's willow)
black cottonwood	
Engelmann spruce	
subalpine fir	

Herb Layer: 60% cover

Dryas drummondii	(yellow mountain-avens)
Fragaria virginiana	(wild strawberry)
Orthilia secunda	(one-sided wintergreen)

Moss Layer: 75% cover

Cladonia chlorophaea

[Barbilophozia lycopodioides (common leafy liverwort)]

SOIL AND SITE:

Moisture Regime:	submesic - subhydric
Nutrient Regime:	rich
* Slope Gradient:	0
* Parent Material:	usually fluvial
* Aspect:	usually flat
Slope Gradient (%):	5 (0-5)
* Slope Position:	lower, toe, or level
Coarse Fragments(%):	0
Soil Drainage:	imperfectly (- rapidly)
Seepage Water:	may be present
Humus Thickness (cm):	3 (1-4)

DISTRIBUTION: uncommon

WILLOW - YELLOW MOUNTAIN-AVENS (WSSFb/07)

INTERPRETATIONS

Management objective: - non-commercial at this time.

NOTES

9 THE ESSFo SUBZONE

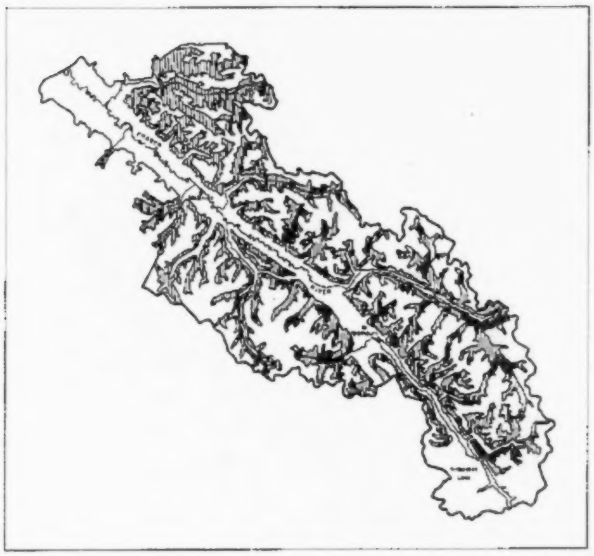


FIGURE 12. Geographic location of the ESSFo subzone in the Prince George Forest Region.

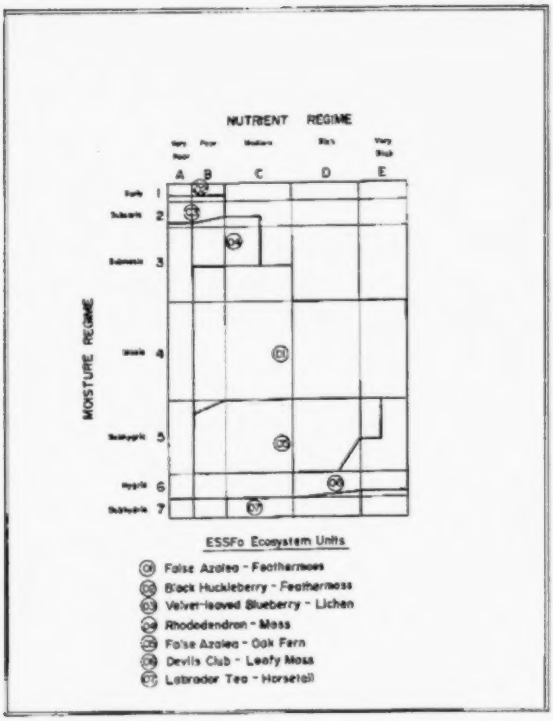


FIGURE 13. Edatopic grid for the ESSFo subzone

KEY TO SITE UNITS OF THE MSSPO

1a Organic soils: a bog

MSSPo/07

1b Mineral soils

2a Oplopanax horridus (p. 10)* and Mnium spp. (p 61) abundant; seepage water may be present

MSSPo/06

2b Oplopanax horridus absent. Mnium spp. low cover (1%) or absent; seepage water usually absent

3a Gymnocarpium dryopteris (p. 26) abundant; lower slope to toe

MSSPo/05

3b Gymnocarpium dryopteris low cover (2%) or absent; mid- to upper slope

4a Vaccinium myrtilloides (p. 15) and Cladina spp. (p. 55) abundant; colluvial veneer over bedrock

MSSPo/03

4b Vaccinium myrtilloides and Cladina spp. low cover (usually 2% each) or absent; various soil parent materials

5a Menziesia ferruginea (p. 10) and Rhododendron albiflorum (white-flowered rhododendron) low cover; colluvial veneer over bedrock, or glaciofluvial

MSSPo/02

5b Menziesia ferruginea and Rhododendron albiflorum abundant; various soil genetic materials

6a Herb layer reasonably well developed (15% cover); Orthilia secunda (p. 30) and Lycopodium annotinum (p. 28) present; mid- to lower slope

MSSPo/01

6b Herb layer poorly developed (15% cover); Orthilia secunda and Lycopodium annotinum usually absent; upper slope

MSSPo/04

*Note: Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982)

ESSFo|01

FALSE AZALEA - FEATHERMOSS

Menziesia ferruginea

Orthilia secunda

Pleurozium schreberi

VEGETATION

Tree Layer: 50% cover
Engelmann spruce, subalpine fir

Shrub Layer: 20% cover

Menziesia ferruginea	(false azalea)
Vaccinium membranaceum	(black huckleberry)
Ribes lacustre	(black gooseberry)
[Rhododendron albiflorum	(white-flowered rhododendron)]
subalpine fir	

Herb Layer: 25% cover

Orthilia secunda	(one-sided wintergreen)
Lycopodium annotinum	(stiff club-moss)
Cornus canadensis	(bunchberry)
Rubus pedatus	(five-leaved bramble)
Listera cordata	(heart-leaved twayblade)

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Barbilophozia lycopodioides	(common leafy liverwort)
Rhytidiadelphus splendens	(step moss)

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	poor - rich
Slope Gradient (%):	29 (0-52)
* Slope Position:	mid- (- lower)
Parent Material:	variable
* Soil Texture:	medium (- coarse)
Coarse Fragments (%):	45 (0-75)
Site Index:	Bl 22 (15-30)
	Pl 19 (24-31)
	Se 22 (17-29)

DISTRIBUTION: common

FALSE AZALEA - FEATHERMOSS (MSSFe/01)

INTERPRETATIONS

Management objective: - manage for Se sawlog on an 80-year rotation.

Concerns:
- drought
- watershed management
- blowdown

Logging: - clearcut

Site preparation:

Objective	- reduce organic layers; reduce debris; prepare planting spots; minimize future brush competition; improve planter access
Mechanical	- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes
Prescribed fire	- broadcast burn (remove L horizon)

Species choice:

Preferred	- Se

Brush hazard: - moderate (false azalea, red raspberry, thimbleberry, Sitka alder, fireweed)

Silviculture applications:
- maintain Bl at up to 300 stems per hectare
- do not plant during mid-summer.

Silviculture problems:
- watershed management and microsite climate is of prime concern, so cutblock size should be examined.
- wind may funnel up many of the drainages in this subzone, causing trees to blow down along cutblock boundaries.
- moderate brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatments are required.

ESSFo/02

BLACK HUCKLEBERRY - FEATHERMOSS

Vaccinium membranaceum

Chimaphila umbellata

Pleurozium schreberi

VEGETATION

Tree Layer: 25% cover
Engelmann spruce, subalpine fir, (lodgepole pine)

Shrub Layer: 50% cover
Vaccinium membranaceum (black huckleberry)
subalpine fir

Herb Layer: 5% cover
Chimaphila umbellata (prince's pine)

Moss Layer: 90% cover
Pleurozium schreberi (red-stemmed feathermoss)
Dicranum scoparium (broom moss)
Rhytidiadelphus triquetrus (electrified moss)

SOIL AND SITE

Moisture Regime:	xeric
Nutrient Regime:	poor
* Aspect:	southerly
* Slope Gradient (%):	steep
Slope Position:	mid- to upper
* Parent Material:	colluvial veneer over bedrock
Soil Texture:	coarse
Coarse Fragments (%):	high
Site Index:	Bl 9 Sw 15

COMMENTS:
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare and small

BLACK HUCKLEBERRY - FEATHERMOSS (ESSFo/02)

INTERPRETATIONS

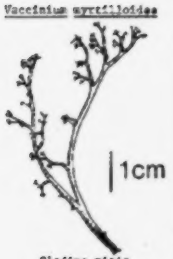
Management objectives:
- non-commercial at this time.
- avoid broadcast burns.
- high wildlife values.

Concerns:
- drought

ESSFo 03

VELVET-LEAVED BLUEBERRY-LICHEN

Vaccinium myrtilloides



Cladina mitis

Cladonia spp.

VEGETATION

Tree Layer: 25% cover
Engelmann spruce, subalpine fir, (lodgepole pine)

Shrub Layer: 55% cover

Vaccinium myrtilloides	(velvet-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
Menziesia ferruginea	(false azalea)
Salix scouleriana	(Scouler's willow)
subalpine fir	
lodgepole pine	

Herb Layer: 5% cover

Cornus canadensis	(bunchberry)

Moss Layer: 80% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Cladonia spp.	) - lichens
Cladina mitis	)

SOIL AND SITE

Slope Gradient (%):	12 (6-18)
Moisture Regime:	xeric - subxeric
Nutrient Regime:	poor
Aspect:	usually southerly
* Parent Material:	glaciofluvial
* Soil Texture:	coarse or moderately coarse
Coarse Fragments (%):	65 (54-75)
Site Index:	Bl 18
	Pl 19 (17-20)
	Se 17

COMMENTS
Limited data because of the rarity of the ecosystem.

DISTRIBUTION: rare

VELVET-LEAVED BLUEBERRY - LICHEN (RESPo/03)

INTERPRETATIONS

Management objectives:

- non-commercial at this time and there should be an on-site inspection before harvesting is allowed.
- high wildlife values.

ESSFo 04

RHODODENDRON - MOSS

Rhododendron albiflorum

Menziesia ferruginea

Plagiothecium schreberi

VEGETATION

Tree Layer: 35% cover
Subalpine fir, lodgepole pine, Engelmann spruce

Shrub Layer: 85% cover

Menziesia ferruginea	(false azalea)
Rhododendron albiflorum	(white-flowered rhododendron)
Vaccinium membranaceum	(black huckleberry)
subalpine fir	
Engelmann spruce	

Herb Layer: 10% cover

[Cornus canadensis	(bunchberry)]

Moss Layer: 90% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum fuscescens	(curly heron's-bill moss)
Barbilophozia lycopodioides	(common leafy liverwort)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	subxeric
Nutrient Regime:	poor
Slope Gradient (%):	45 (22-60)
* Slope Position:	upper
* Soil Texture:	moderately coarse
* Coarse Fragments (%):	62 (25-75)
Site Index:	Al 17 (14-20)
	Pl 20 (17-22)
	Se 18 (16-23)

DISTRIBUTION: common

RHODODENDRON - MOSS (ESSFo/04)

INTERPRETATIONS

Management objective:	- manage for Se sawlog on a 90-year rotation.
Concerns:	- drought
Logging:	- clearcut
Site preparation:	
Objectives	- maintain organic layers; reduce debris; improve planter access; prepare plantable spots
Mechanical	- no mechanical site preparation on steep slopes or shallow soils; patch scarifiers can be used (carefully!) on sites with deeper soils
Prescribed fire	- broadcast burn (remove L horizon), or brown and burn
Species choice:	
Preferred	- Se
Acceptable	- Pl
Brush hazard:	- moderate (false azalea, fireweed)
Silviculture applications:	- low fuel loadings may make it difficult to broadcast burn these sites. One may have to wait for invasion of the site by vegetation and then conduct a brown and burn program to treat the site for planting.
Silviculture problems:	- wind may funnel up many of the drainages in this subzone causing trees to blow down along cutblock boundaries. - moderate brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatments are required. - Pl may be susceptible to snowpress damage.

ESSFo05

FALSE AZALEA - OAK FERN

Ribes lacustre

Rubus pedatus

Gymnocarpium dryopteris

VEGETATION

Tree Layer: 40% cover
Subalpine fir, Engelmann spruce

Shrub Layer: 35% cover

Menziesia ferruginea	(false azalea)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Ribes lacustre	(black gooseberry)
Rhododendron albiflorum	(white-flowered rhododeodron)

Herb Layer: 40% cover

Rubus pedatus	(five-leaved bramble)
Lycopodium annotinum	(stiff club-moss)
Tiarella unifoliata	(one-leaved foamflower)
Gymnocarpium dryopteris	(oak fern)
Dryopteris assimilis	(spiny wood fern)
Orthilia secunda	(one-sided wintergreen)
Listera cordata	(heart-leaved twayblade)
Cornus canadensis	(bunchberry)
[Valeriana sitchensis	(Sitka valerian)]

Moss Layer: 85% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Barbilophozia lycopodioides	(common leafy liverwort)
[Hylocomium splendens	(step moss)]

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	(poor -) rich
Slope Gradient (%):	30 (7-64)
* Slope Position:	lower to toe, or mid- with northerly aspect
Parent Material:	variable
Soil Texture:	variable
Coarse Fragments (%):	42 (10-83)
Site Index:	Bl 23 (19-34)
	Se 25 (18-32)

DISTRIBUTION: common

FALSE AZALEA - OAK FERN (BSSPo/05)

INTERPRETATIONS

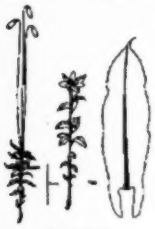
Management objective:	- manage for Se sawlog on a 90-year rotation.
Concerns:	- compaction - high water table - windthrow - snowpack - watershed management
Logging:	- clearcut
Site preparation:	
Objectives	- reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition; avoid compaction on finer-textured soils
Mechanical	- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes
Prescribed fire	- broadcast burn in summer, or brown and burn.
Species choice:	
Preferred Acceptable	- Se
Brush hazard:	- very high (false azalea, red raspberry, Sitka alder, devil's club, fireweed)
Silviculture applications:	- maintain Bl at up to 300 stems per hectare - harvest sites only in the winter. - summer planting. - use large planting stock. - a brushing and weeding program will be required.
Silviculture problems:	- getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer. - very high brush competition will require an inspection of harvested sites at time periods 2 and 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition. - use of cattle for vegetation control on 0-30% slopes could be beneficial.

ESSFo 06

DEVIL'S CLUB - LEAFY MOSS

Oplopanax horridus

Cymnocarpium dryopteris



Mnium spp.

VEGETATION

Tree Layer: 45% cover
Engelmann spruce, subalpine fir

Shrub Layer: 75% cover

Oplopanax horridus	(devil's club)
Menziesia ferruginea	(false azalea)
Ribes lacustre	(black gooseberry)
Vaccinium membranaceum	(black huckleberry)
subalpine fir	

Herb Layer: 55% cover

Gymnocarpium dryopteris	(oak fern)
Rubus pedatus	(five-leaved bramble)
Dryopteris assimilis	(spiny wood fern)
Cornus canadensis	(bunchberry)
Lycopodium annotinum	(stiff club-moss)
Tiarella unifoliata	(one-leaved foamflower)
Streptopus amplexifolius	(clasping twistedstalk)
Athyrium filix-femina	(lady fern)

Moss Layer: 80% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Mnium spp.	(leafy mosses)
Barbilophozia lycopodioides	(common leafy liverwort)
Hylocomium splendens	(step moss)

SOIL AND SITE

Moisture Regime:	(subhygric -) hygric
Nutrient Regime:	(poor -) rich
Slope Gradient (%):	28 (7-52)
* Slope Position:	lower - toe
Parent Material:	variable
Soil Texture:	variable
Coarse Fragments (%):	49 (10-83)
Site Index:	Bl 25 (19-31)
	Se 33 (25-37)

COMMENTS
This association is very similar to the ESSFo/05. Sites in the ESSFo/06 have a higher (greater than 50%) shrub cover and the presence of devil's club, frequently with lady fern. These sites are also more productive.

DISTRIBUTION: fairly common

DEVIL'S CLUB - LEAFY MOSS (ES6Fo/06)

INTERPRETATIONS

Management objective: - manage for Se sawlog on a 90-year rotation.

Concerns:
- compaction
- high water table
- windthrow
- snowpack
- watershed management

Logging: - clearcut

Site preparation:

Objective	- reduce organic layers; reduce debris; prepare planting spots; improve planter access; minimize future brush competition; avoid compaction on finer-textured soils
Mechanical	- patch scarifier or disc trencher in lighter slash; V-plow, or patch scarifier with blade, in heavier brush; FMC with 6-way blade on finer-textured soils or steep slopes
Prescribed fire	- broadcast burn in summer, or brown and burn

Species choice:

Preferred	- Se

Brush hazard: - very high (red raspberry, devil's club, fireweed)

Silviculture applications:
- harvest sites only in the winter.
- summer planting.
- use large planting stock.
- a brushing and weeding program will be required.

Silviculture problems:
- getting the appropriate conditions to achieve a good prescribed burn is not likely to occur unless burning is conducted during the summer.
- very high brush competition will require an inspection of harvested sites at time periods 2 and 4 years after planting. These inspections may indicate the need for further brushing and weeding to keep back brush competition.
- use of cattle for vegetation control on 0-30% slopes could be beneficial.

ESSFo 07

LABRADOR TEA - HORSETAIL

Ledum groenlandicum

Equisetum arvense

Sphagnum capillaceum

VEGETATION

Tree Layer: 20% cover
Hybrid white spruce, subalpine fir, (lodgepole pine)

Shrub Layer: 55% cover

Ledum groenlandicum	(Labrador tea)
Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Menziesia ferruginea	(false azalea)
Salix spp.	(willows)
subalpine fir	

Herb Layer: 65% cover

Equisetum arvense	(common horsetail)
Carex disperma	(soft-leaved sedge)
Calamagrostis canadensis	(bluejoint)
Petasites palmatus	(palmate coltsfoot)
Rubus pedatus	(five-leaved bramble)
Pyrola asarifolia	(rony wintergreen)
Lycopodium annotinum	(stiff club-moss)
Cornus canadensis	(bunchberry)
Epilobium angustifolium	(fireweed)
Gymnocarpium dryopteris	(oak fern)
Leptarrhena pyrolifolia	(leatherleaf saxifrage)
Vaccinium caespitosum	(dwarf blueberry)

Moss Layer: 65% cover

Sphagnum capillaceum	(common red sphagnum)
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Aulacomnium palustre	(glow moss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	subhydric
Nutrient Regime:	oligotrophic
* Slope Gradient (%):	8 (3-13)
* Slope Position:	(lower -) toe
* Parent Material:	fluvial, sometimes with organic capping
Soil Texture:	medium to fine or organic
Coarse Fragments (%):	14 (0-35)
Site Index:	Bl 16 (13-17) Se 17 (14-22)

DISTRIBUTION: rare and small in size

LABRADOR TEA - HORSETAIL (ESSPo/07)

INTERPRETATIONS

Management objective: - non-commercial at this time.

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NOTES

APPENDIX 1. Meso slope position diagram

a. Crest - the generally convex uppermost portion of a hill (meso scale). It is usually common to all directions; no distinct aspect.

b. Upper Slope - the generally convex upper portion of the slope of a hill (meso scale) immediately below the crest. It has a convex surface profile with a specific aspect.

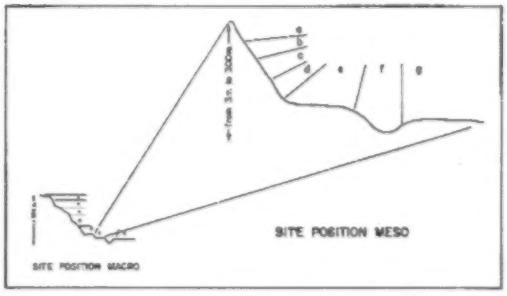
c. Middle Slope - the area of the slope of a hill between the upper slope and the lower slope, where the slope profile is not generally concave or convex; it has a straight or somewhat sigmoid surface profile with a specific aspect.

d. Lower Slope - the area toward the base of the slope of the hill. It generally has a concave surface profile with a specific aspect.

e. Toe - area defined by extent of homogeneous site of slight slope; clearly demarcated by an abrupt decrease in the slope (below and adjacent to the lower slope).

f. Depression - any area that is concave in all directions; generally at the foot of a meso scale hill or in generally level area.

g. Level - any level meso scale area not adjacent to a meso scale hill. The surface profile is generally horizontal with no significant aspect.



APPENDIX 2. Hand texturing field guide

Soil texture refers to the relative proportions of the sand, silt, and clay separates within a soil. These separates have their own distinctive properties of "feel", allowing one to estimate their proportions in a sample of soil by hand texturing. Texture can be estimated very roughly from a dry sample. Clayey materials are very hard, loamy and silty materials are slightly hard to soft, and sandy materials are loose grained. To be more precise, hand texturing should be done using the wet sample procedure given below.

Step 1

Obtain a small handful of soil, crush it in the hand, and remove coarse fragments (particles greater than 2 mm in diameter).

Step 2

Gradually add water to the soil and work it into a moist putty with a soil knife or fingers. The correct moisture content is important. If the putty flows with the force of gravity, then it is too wet. If it crumbles when rolled, then it is too dry. It should have the consistancy of a filler putty.

Step 3

Determine stickiness of the soil putty by working it between the thumb and forefinger, pressing and then separating the fingers. An estimate of clay content can be made in this way. (Clay limits below are approximate).

NONSTICKY: practically no soil material adheres to the thumb and forefinger (less than 10% clay).

SLIGHTLY STICKY: soil material adheres only to one of the fingers and comes off the other rather cleanly. The soil does not stretch appreciably when fingers are separated (less than 25% clay).

STICKY: soil material adheres to both fingers and stretches slightly before breaking when fingers are pulled apart (25-40% clay).

VERY STICKY: soil putty adheres strongly to both fingers and stretches distinctly before breaking (greater than 40% clay).

Step 4

Determine the grittiness of the soil putty by rubbing it between thumb and forefinger. An estimate of sand content can be made in this way. (Sand limits below are approximate).

NONGRITTY: Little or no grit can be felt (less than 20% sand).

SLIGHTLY GRITTY: Some grit is felt but nongritty material (silt and clay) is dominant (20-50% sand).

GRITTY: Sand is felt as the dominant material. Some nongritty material can be felt between sand grains (50-80% sand).

VERY GRITTY: Sand is the only material that is felt. Little or no nongritty material present (greater than 80% sand).

Step 5

After stickiness and grittiness have been determined, the hand texturing table can be used as an approximate guide to the textural class of the soil. The textural triangle (Figure 14) can be used for a more accurate determination of the textural class.

	NONGRITTY (<20% sand)[a]	SLIGHTLY GRITTY (20-50% sand)	GRITTY (50-80% sand)	VERY GRITTY (>80% sand)
VERY STICKY (>40% clay)[a]	SILTY CLAY	CLAY	SANDY CLAY	--
STICKY (25-40% clay)	SILTY CLAY LOAM	CLAY LOAM	SANDY CLAY LOAM	--
SLIGHTLY STICKY (10-25% clay)	SILT LOAM or SILT	LOAM[b]	SANDY LOAM	--
NONSTICKY (<10% clay)	--	--	--	LOAMY SAND or SAND

[a]Sand and clay limits are approximate.
[b]A loam is a textural class exhibiting physical properties intermediate between those of sand, silt, and clay.

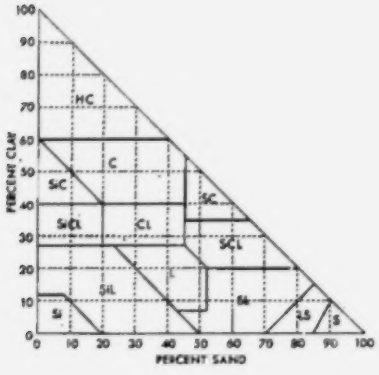


FIGURE 14. Soil textural triangle.

. .ENDIX 3. Identification of upland humus forms

Mors:	- matted F horizon[a] - common fungal mycelium (white or yellow) - little or no intermixing of organic and mineral materials - abrupt boundary between organic and mineral horizons
Moders:	- loosely arranged F horizon[a] - friable - insect droppings - fungal mycelium and soil organisms (arthropods and occasional earthworms) - intermixing of organic and mineral horizons - gradual transition between mineral and organic horizons
Mulls:	- often no F[a] or H horizons (thin if present) - insect droppings abundant - usually many soil organisms but may form from decomposition of a dense network of roots (N.B: usually abundant earthworms) - considerable of intermixing of mineral and organic layers, with incorporation of organic matter into surface mineral soil (Ah horizon)

[a]F horizon: horizon in which partial (rather than entire), macroscopically recognizable vegetative structures are dominant, i.e., the horizon is partially decomposed.

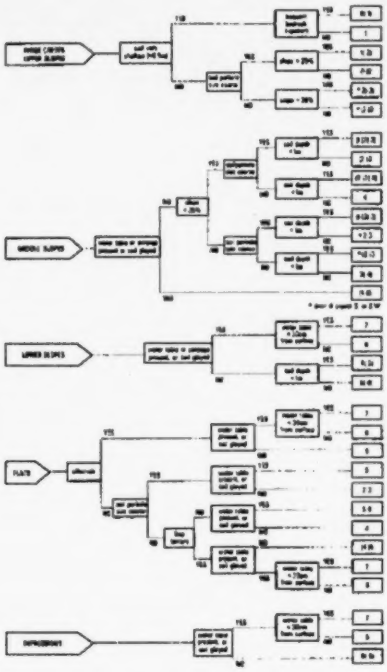
APPENDIX 4. Key to the identification of potential moisture regime (part 1). (from Green et al. 1984)

This key was devised to aid field staff in identifying potential moisture regimes using readily observable environmental features. It should be applied with caution on ridge crests, upper slopes, and middle slopes which have soils with thick (>20 cm) organic layers. Moisture regime in these cases will generally be higher than indicated. The table below provides definitions for the categories used in the key.

Category	Definition
Ridge crest	height of land; usually convex slope shape.
Upper slope	the generally convex shaped, upper portion of a slope.
Middle slope	the portion of a slope between the upper and lower slopes; the slope shape is usually straight.
Lower slope	the area towards the base of a slope; the slope shape is usually concave. It includes toe slopes which are generally level areas located directly below and adjacent to the lower slope.
Flat	any level area (excluding toe slopes); the surface shape is generally horizontal with no significant aspect.
Alluvium	post-glacial, active floodplain deposits along rivers and streams in valley bottoms; usually a series of low benches and channels.
Depression	any area that is concave in all directions; usually at the foot of a slope or in flat topography.
Soil depth	depth from the mineral soil surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented materials (e.g. "hardpan").
Gleyed	soils that have orange coloured mottles indicative of a fluctuating water table. Permanently gleyed soils are dull yellowish, blue, or olive in colour.
Soil particle	sandy[a] with > 35% volume of coarse fragments, or size coarse loamy[a] with > 70% volume of coarse fragments.
Fine texture	silty[a] or clayey[a] with low coarse fragment volume.

[a]Sandy - LS,S; loamy - SL, L, SCL; clayey - SiCL, CL, SC, SiC, C; silty - SiL, Si.

APPENDIX 4. Key to the identification of potential moisture regime (part 2)



[1]Numbers on the right refer to moisture regime classes as used in the edatopic grid (FIGURE 3): 0.1 = xeric; 2 = subxeric; 3 = submesic; 4 = mesic; 5 = subhygric; 6 = hygric; 7 = subhydric.

APPENDIX 5. Key to determination of nutrient regime[a]

1a Coarse-textured

2a Very high coarse fragments (>50%) or very shallow (<30 cm) soil.

3a Mor humus form

Very Poor

3b Moder humus form

Poor - Medium

2b Low or zero coarse fragments, deep soil

4a Mor humus form

Poor

4b Moder humus form

Medium

4c Mull humus form

Rich - Very Rich

1b Moderately coarse- and medium-textured

5a Very high coarse fragments (>50%); or very shallow soil (<30 cm); or shallow rooting depth

6a Mor humus form

Poor

6b Moder

Medium

5b Low or zero coarse fragments without restricted rooting depth

[a]The presence of base-rich parent materials (limestone, shales, basalt) may improve the nutrient status.

7a Mor humus form

Poor - Medium

7b Moder humus form

Medium - rich

7c Mull humus form

Very rich

1c Moderately fine- and fine-textured

8a Very high coarse fragments (rare); or very shallow soil; or shallow rooting depth (<15 cm)

9a Mor humus form

Poor - Very Poor

9b Moder humus form

Medium - Poor

9c Mull humus form

Rich

8b Low or zero coarse fragments, with good rooting depth (>20 cm)

10a Mor humus form

Medium

10b Moder humus form

Rich

10c Mull humus form

Very Rich

APPENDIX 6. Forest cover types associated with each site unit

Ecosystem Unit	Forest Cover Types
ICHvk1/01	HC, CH, C(H), H(C)
ICHvk1/02	HC, CH
ICHvk1/03	HC, CH
ICHvk1/04	HC, H, H(C)
ICHvk1/05	S, SC, S(Ac)
ICHvk1/06	CH, HC
ICHmc1/01	HC, CH, H(C), H SB, HCF, SBF
ICHmc1/02	F(F), F
ICHmc1/03	HC, HF, H(C), H(F), FH
ICHmc1/04	CH, HC
ICHmc1/05	CH, HC, SB, BB
ICHmc1/06	C, CS
ICHmc1/07	Sb(Pl)
ICHmc1/08	H, HC
ICHwk3/01	CH, HC
ICHwk3/02	HPl, PlH
ICHwk3/03	CH, HC, CB
ICHwk3/04	HF, FH
ICHwk3/05	CH, HC, SB, CS
ICHwk3/06	SB, Sb(Hp)
ICHwk3/07	HC, H(C)
ICHwk3/08	CH, HC
ICHwk3/09	SbPl, PlSb
SWSdh/01	FPlS, FPl, F(Pl.S), S(F.Pl) with B, At, Hp minors
SBSdh/02	Pl
SWSdh/03	F, FPl, F(Pl)
SBMdh/04	Pl, Pl(F), PlF
SBSdh/05	Pl, Pl(S)
SWSdh/06	SF (At.Pl), SAt(F,Pl), S(At.F.Bl), Ats
SBSdh/07	S, S(Ac, At, B, Pl), SAc
SBSdh/08	Sb, Sb(Pl)
SBSdh/09	Sb
BWBPb/01	B, BB, BBK
ESSFb/02	B, BB, BBK
ESSFb/03	B, BB, BB
ESSFb/04	BB, BS, B
ESSFb/05	BB, BS, B
ESSFb/06	BB, BS, B
ESSFo/01	B(B), SB
ESSFo/02	S(B), BB
ESSFo/03	S(B), BB, S(Pl), Pl
ESSFo/04	B(Pl), P(B), Pl, occasionally B(E)
ESSFo/05	Sb, S(B)
ESSFo/06	B(B), Sb
ESSFo/07	SB, B(B), B(Pl)